State of the Field.

Teaching with Objects project research report: methods, tools, and possibilities of teaching and learning with objects.

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The findings presented in this report result from the research conducted by Jill Decrop Ernst (Things That Talk) and Monica Zagallo (University of Padua). This report is the outcome of the Erasmus+ project: *Teaching with Objects* and the result of a collaboration between the University of Strasbourg, Humboldt University, the University of Padua, the Ghent University Museum, Things That Talk Foundation, and the Dutch Foundation for Academic Heritage. Thus, the entire project group takes full responsibility for any mistakes or shortcomings that might be present in this document.

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Abstract

Objects such as the culturally relevant artifacts that are kept and cared for in our museums, archives, and libraries, or items that are part of our every-day life have great potential for higher education. While teaching with objects is not new, recently, the value and potential of these collections has been rediscovered as several institutions throughout Europe have started to use objects for teaching again. As a result of the material and digital turn but also due to the Covid-19 pandemic, new object-based practices have emerged.

The Erasmus Plus *Teaching with Objects* project aims at exploring new ways to harness this creativity and innovative power and to make it accessible to university educators throughout Europe. In particular, we wish to anchor the professional status of object-based teaching and learning (OBTL) within evaluation practices in academia. The project was promoted by the Digital initiatives working group of Universeum and involves the University of Strasbourg, the Humboldt University, the University of Padua, the Ghent University Museum, Things That Talk Foundation, and the Dutch Foundation for Academic Heritage. All partners involved in the project have extensive experience in object-based practices, especially with academic heritage collections. Thus, while our research has focused on objects in general, we are interested in exploring how these might benefit and be applied to teaching and learning with academic heritage objects[1].

[1] It is important to note that Things That Talk (TTT) does not only focus on academic heritage but all objects, tools, and artifacts.

In order to reach the aims of the project, we have begun by collecting and investigating:

- Methods and tools for teaching with objects in a variety of settings including in digital and hybrid situations.
- The opportunities and challenges of teaching with objects in different fields in the digital age.

We have conducted a literature search, conducting interviews with primarily European OBTL practitioners complemented with observations of lessons and surveys with students.

Our literature search has shown that sources on OBTL tend to focus on specific examples. These practices more often take place in presence, meaning that students, teachers and objects are all in the same physical space. Sources were more prominently found in the US, the UK and Australia, and in fields such as archeology, museum studies, or biology. Finally, we could find little information on students' experiences, inclusivity, and digital accessibility.

Overall, research has highlighted the vast heterogeneity of OBTL practices when it comes to their modes of delivery, the objects and tools used, the steps taken during the lesson and the activities conducted. Regardless of the wide variety of examples collected, our interviewees have shared some common ground. Like in the literature, we see an overwhelming preference for in presence practices, moreover OBTL seems to more predominantly take place in specific fields such as history of science. Similarly, regardless of the field in which objects are used, it seems that OBTL is especially beneficial to

impart students with subject-specific knowledge, transferable skills, and to familiarize them with objects. We also collected insights on inclusivity and digital accessibility. Overall, most interviewees adapt to situations as they emerge. Similarly, when it comes to collecting students' perspectives, educators mostly get a sense of students' experiences by looking at their reactions during the lesson and relying on general feedback they receive. Additional research would be needed to further explore these topics.

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I. Introduction

Objects such as the culturally relevant artifacts that are kept and cared for in our museums, archives, and libraries, or items that are part of our every-day life have great potential for higher education. These objects and their associated stories have a unique power to enrich teaching and learning.[2] While being neglected in the last century partly because of changes in teaching and research practices in many disciplines, the value and potential of objects for higher education have recently been rediscovered and several institutions throughout Europe have started to use objects for teaching again.[3] Moreover, the digital turn has provided opportunities, tools, and infrastructures for teaching, digitization, and dissemination. As a result, new object-based practices have emerged all over the world in research and teaching.[4] The Covid-19 pandemic pushed educational, collections, and museum staff to adapt and rethink their educational practices, experimenting with tools that would enable their students to experience the handling of an object in an online and hybrid environment.[5]

The Erasmus + *Teaching with Objects* project is interested in these practices and aims at exploring new ways to harness this creativity and innovative power and to make it accessible to university educators throughout Europe. The project was promoted by

[2] Duhs, 2011; Hess et al, 2017, p.349; Tanabashi, 2021, p.3; Hardie, 2015, p.9
[3] Causey, 2022, p.78; Adams, 2015, p.89
[4] Paris & Hapgood, 2002; Tanabashi, 2021, p.2-4
[5] Chatterjee et al, 2015, p.1

the Digital initiatives working group of Universeum. It involves the University of Strasbourg, the Humboldt University, the University of Padua, the Ghent University Museum, Things That Talk Foundation, and the Dutch Foundation for Academic Heritage.

As a community of partners involved in object-based practices using academic heritage[6], we wish to foster and support teaching and learning involving these collections. To do this, we collected and analyzed methods and tools for teaching with objects, including in digital and hybrid pedagogical situations. Indeed, OBTL practices with other kinds of objects might also be adapted to and benefit practices using academic heritage artifacts. Moreover, we intended to build a network of actors involved in teaching with objects to explore their needs as well as the opportunities and challenges of OBTL in different fields in the digital age. All data collected is intended to be shared through an online platform for teaching with objects, further establishing a community of practices supporting teaching with objects from university museums and collections. Through this platform, we wish to anchor the professional status of OBTL within evaluation practices in academia.

While a wide array of literature has expanded on teaching with objects reflecting on specific methods, tools, and the potential and challenges of teaching with objects in different fields, these sources limit themselves to only a few examples. These examples more prominently take place in fields such as archeology, museum studies,

[6] It is important to note that Things That Talk (TTT) does not only focus on academic heritage but all objects, tools, and artifacts.

or biology while we could not find any sources on OBTL practices in mathematics or chemistry. Similarly, practices are more prominently taking place in presence, meaning that students, educators/curators, and objects are in the same physical space. Moreover, literature seems to focus on English, American, and Australian practices.[7] Finally, we could find little information on students' experiences, inclusivity, and digital accessibility when it comes to teaching with objects.

To address these shortcomings, this research aimed at exploring European teaching with objects practices by conducting interviews complemented with observations of lessons, allowing us to investigate teachers', curators', and students' perspectives. Interview samples also aimed to be diverse regarding the fields and settings (digital, hybrid, or in presence) in which the lessons took place. In addition to collecting specific lessons examples, this research has explored how teachers and curators have worked towards making their practices inclusive and digitally accessible.

In **section II**, this report will expand on definitions of object-based teaching and learning and what is meant when talking about teaching with objects in presence, in digital or hybrid settings. **Section III** will introduce an overview of literature on teaching with objects methods, the benefits and challenges of teaching with objects in different fields, and the tools used will be presented. Then, the methodology used to elicit data will be outlined in **section IV**. Finally, **section V** will expand and introduce a reflection on the collected

[7] Chatterjee, 2011, p.179; Adams, 2015, p.89; Tanabashi, 2021, p.2; Object-based learning (OBL) in Higher Education: Fuma. Flinders University, n.d, Kreps, 2015,p.96; Causey, 2022, p.78

methods and tools used by teaching with objects practitioners in Europe and the benefits and challenges of teaching with objects in different disciplines.

II. Definitions

Throughout this research, the term object-based teaching and learning (OBTL) will be used to refer to teaching with objects practices. OBTL is a student-centered and experiential pedagogy that involves the active integration of objects in the learning environment.[8] Here, **objects** refer to any item that belongs to material culture such as specimens, artifacts, or artworks.[9] It can also apply to old books, manuscripts, archives, but also digital representations of objects.[10] These objects serve as a primary medium for learning new ideas, realizations, creative work, or professional/personal development.[11]

When discussing OBTL, it is important to differentiate various modes of delivery. This research will refer to "in presence", "digital" and "hybrid" OBTL. Most commonly, "**in presence**" practices involve students interacting with "physical" objects, their educators, and one another on site (e.g. classroom, museum). **"Digital"** practices most often refers to lessons in which students are remotely connected and interact with objects, their educators, and one another digitally. Students watching a recording of a lesson from home also falls under

[8] Barlow, 2017, p.27; Object-Based Learning | Academic Technologies, n.d.; Tanabashi, 2021, p.3; Chatterjee, Hannan and Thomson, 2015, p.1; Object-based learning (OBL) in Higher Education: Fuma. Flinders University, n.d.
[9] Pearce, 1994; Object-Based Learning | Academic Technologies., n.d.,Tanabashi, 2021, p.2
[10] Object-Based Learning | Academic Technologies., n.d., Tanabashi, 2021, p.2
[11] Object-based learning (OBL) in Higher Education: Fuma. Flinders University, n.d

this remote dimension. Hybrid and blended lessons happen in any other cases. For **hybrid** lessons, half of the students take part in the lesson in presence while the other half is connected remotely. As a sub-category of hybrid, **"blended"** OBTL consists of a mix of online and face-to-face tutorials.[12] Not all practices fit these categories, as such it becomes necessary to address examples case by case.

III. State of the art

*This section will first expand on and reflect on methods for teaching with objects, including the different modes of delivery (see **section 1.1**), and the key activities that can be conducted during OBTL lessons (see **section 1.2**). We will then present benefits and challenges for teaching with objects in different fields (see **section 2**) and tools (see **section 3**). Finally, this section will be concluded with a short reflection (see **section 4**).*

1. Methods for teaching with objects

While teaching with objects practices share a same pedagogical model (i.e. Experiential Learning Theory), they vary widely with their modes of delivery (in presence, online, hybrid, blended), objects, tools, and activities used.

1.1 In presence, digital, and hybrid OBTL

OBTL lessons are most widely delivered **in presence**. This can be explained by the importance of physical interaction with objects.

[12] Davidson, 2020

Touching physical artifacts delights students and has a positive impact on their mental and physical health.[13] It also allows them to build their confidence and competence in an environment with fewer access barriers.[14] Moreover, the fuller range of sensory experiences encountered leads to better retention of information and a more memorable learning experience.[15] Objects and their history become much more tangible, making it easier for students to imagine how they were used and handled in their original context.[16] However, during in presence practices, students' physical handling of objects is not always guaranteed. In archives and museums, physical access to objects is highly controlled with time limit and strict staff supervision and tends to be limited to those already established as experts in their fields.[17] Thus, in many cases, there is no way to reach the objects that are connected to the classes.

The immersive nature of going on location has also been highlighted as a crucial added value of teaching with objects in presence due to its affective impact on students, helping them explore their attitudes towards learning.[18] Moreover, in presence lessons might cause practical and logistical concerns such as the challenges of stationary classroom designs or student-to-object ratio.[19] It also causes

[13] Loic, 2022, p.51: Pollalis et al, 2018
[14] Loic, 2022, p.51
[15] Thogersen et al, 2018, p.3; Smith, 2016, p.3; Duhs, 2011, p.184; Pollalis et al, 2018; Hardie, 2015; Cobley, 2022, p.78
[16] Chatterjee and Duhs, 2010, p.2; Sparks, 2011; Cobley, 2022, p.84; Loic, 2022, p.44; Object-Based Learning | Academic Technologies, n.d.
[17] Pollalis et al, 2018, Loic, 2022, p.50, Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2) ,2020; CAA Australasia, 2020
[18] Cobley, 2022, p.86
[19] Cain, 2011

major limitations pertaining to (im)mobilities for people with disabilities (especially field trips).

Due to the Covid-19 pandemic, teaching with objects lessons have increasingly taken place in **online or hybrid** formats. Digital and hybrid practices allow educators and curators to include large-scale cohorts in their sessions and make lessons available at any time and from any location.[20] However, large cohorts reduce social interactions. Some educators have also complained that not seeing the faces of their students during hybrid and online teaching, when projecting presentations for instance, impacted their ability to evaluate if students had understood what was taught.[21] Moreover, one might encounter technical challenges and some students might struggle as they lack proper internet access, or even do not have computers.[22]

In contrast, digital surrogates play a key role in helping in the preservation of material while making them available to wider audiences.[23] Virtual archives, libraries, and museums eliminate the costs and carbon footprint associated with traveling to institutions to access objects, making them more economic and ecological alternatives.[24] They also allow one to consult objects without time restriction, unlimitedly and repeatedly, with the ability to zoom in on details more closely than one could with the naked eye.[25] However,

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[20] Martindale, 2020

[21] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020

[22] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020

[23] Loic, 2022, p.41; Object-Based Learning | Academic Technologies,n.d.

[24] Loic, 2022, p.41

[25] Loic, 2022, p.41; Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020, Barlow, 2017

availability does not equate with accessibility.[26] Functionalities often overlook users with disabilities, are nearly always designed for Anglophone audiences, and often assume pre-existing expertise. Increasingly digitized collections also make it more difficult to get financial support and access collections as institutions argue that digital surrogates act as suitable alternatives to in-person consultation.[27]

Many scholars have lamented the lack of physical dimension of interacting with objects online.[28] Interactions with digital substitutes limit the level of interaction and sensory engagement with the object.[29] Viewing multiple objects through a digital interface makes it difficult to compare them, discern their scale, or understand the relations of parts to the whole.[30] However, digital OBTL does not necessarily mean a lack of physical interactions. Students could experience sensory interactions with objects by making objects, and interacting with everyday substitutes or objects from formal collections.[31] Moreover, working online could enable sensory practices and activities which could otherwise not happen in an academic or museum context (e.g. cook-along activity based on an old recipe book).[32]

Blended or hybrid learning might be a great alternative to both in presence and digital OBTL, allowing the physical and the digital to

[26] Loic, 2022, p.51
[27] Loic, 2022, p.51
[28] Loic, 2022, p.42; Irving, 2021
[29] Martindale, 2020
[30] Loic, 2022, pp.45-7
[31] Hatchwell & Halliwell, 2021; Woodwall, 2021
[32] Woodwall, 2021

complement each other. One could move between digital and in-person as needed, depending on circumstances.[33] One of the clear advantages of hybrid OBTL has been that it enables layered learning (e.g. through the use of videos to explore how objects were made).[34] However, dealing with in presence as well as remotely connected students at the same time is difficult for educators, who need to invest more intensive work to oversee and facilitate classroom activities and manage chat messages.[35]

In presence, digital and hybrid, practices all present and make up for each other's strengths and weaknesses. However, the importance of sensory engagement with objects overpowers the challenges posed by in person practices and the potential of online and hybrid practices, as there is an uncontested preference for in presence lessons. For further information on teaching with objects in presence, digital and hybrid settings please refer to **Appendix 2**.

1.2. OBTL activities

A basic **show-and-tell or object demonstration** is the most common and basic form of OBTL and works best for short sessions and smaller class sizes.[36] It involves less commitment from educators and allows them to cover a large amount of content in a short time.[37] However, this format encourages a passive transfer of information

[33] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020
[34] Woodwall, 2021
[35] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020; Woodwall, 2021
[36] Sparks, 2011; Smith, 2016, p.1
[37] Cain, 2011, p.199; Smith, 2016, p.4; Sparks, 2011

from teacher to students, which does not support the development of knowledge and deep understanding.[38]

Another recurrent activity in OBTL consists of students conducting **object-based research** (see Chatterjee, 2008; Barlow, 2017; Ladkin et al, 2011; Kador et al, 2018; Causey, 2015; Kreps, 2015).[39] For instance, Chatterjee (2008) asked medical students to conduct research on the therapeutic potential of taking museum loan boxes to patients. Object-based research is highly beneficial for museums as many stored objects have had very little research conducted on them and require better documentation.[40] This research can be added to the knowledge base of the institute and shared with the wider public.[41] Research offers the greatest reward in terms of understanding and making students' work public motivates students to do their best.[42] Students will learn to avoid plagiarism and experience working in a professional manner.[43] However, object-based research is more time-consuming and difficult to organize as it requires greater contact time and more than just one class.[44]

For longer sessions, **"the activity workstation"** (see Sparks, 2011; Smith, 2016; Hardie, 2015; Davies & Nicholl, 2017) features objects while allowing students to work cooperatively, sharing and

[38] Smith, 2016, p.4; Sparks, 2011
[39] Chatterjee and Duhs, 2010, p.2; Chatterjee, 2008, p.2; Cobley, 2022
[40] Kador et al, 2018
[41] Kador et al, 2018; Barlow, 2017, Ladkin et al, 2011; Causey, 2015; Kreps, 2015
[42] Sparks, 2011; Causey, 2015
[43] Barlow, 2017; Ladkin et al, 2011
[44] Sparks, 2011; Barlow, 2017

building their knowledge by learning from one another.[45] Discussing with peers allows students to be less constrained in what they say.[46] Moreover, such workstations are more engaging for students and allow them to develop social and analytical skills while gaining confidence.[47]

As part of the activity workstation, students might be asked to handle **"mystery objects"** (see Hardie, 2015, Philips et al, 2021; Causey, 2015; Woodwall, 2021; Davies & Nicholl, 2017) and explore what they are, what functions they might have, what materials and techniques were used to create them, and who created them in which context.[48] For instance, Kador et al (2018), introduce a first case study in which students are given vertebrates without a label and are tasked with identifying the animal from which it came from, and come up with a general to detailed description of these specimens. This activity has been enjoyed by students and is especially stimulating through its problem-solving and/or experimental nature.[49] Woodwall (2021) has claimed that it was impossible to conduct "mystery object" sessions during lockdown. However, Davidson (2020) and Philips and al (2021) have sent 3D-printed mystery vertebrate skulls or fossils to their students, allowing them to have a similar specimen-based identification exercise in a remote setting.

[45] Object-Based Learning | Academic Technologies,n.d.; Sparks, 2011; Smith, 2016, p.4
[46] Sparks, 2011
[47] Smith, 2016, pp.4-5; Hardie, 2015
[48] Object-Based Learning | Academic Technologies,n.d., Smith, 2019; Marie, 2011, p.188
[49] Davies & Nicholl, 2017; Marie, 2011, p.189; Object-Based Learning | Academic Technologies,n.d.; Hardie, 2015; Philips et al, 2021

Students might also be asked to **(re-)create objects** (physically or digitally) as a thought experiment or as an actual re-creation.[50] (see Tanabashi, 2021; Kador et al, 2018, Turin, 2015; Hess et al, 2019; *Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2)*; Object-Based Learning | Academic Technologies, n.d.; CAA Australasia, 2020). When it comes to thought experiments, Thomas et al (2018) introduce a case study in which digital humanities students are shown a collection and asked to describe the means they would allow the digitization of the collection and for it to be published and searched online with more ease. With regards to the creation of digital reproduction of objects, Hess et al (2017) have asked students to work in groups and to select an object and create 3D imaging of objects, and then modify 3D prints of the objects. Through this activity, students are asked to answer curatorial questions such as the potential and challenges of physical reproduction of objects through 3D printing for visually impaired museum visitors. The creation of digital surrogates allows students to gain a deeper understanding of the potential and limits of technologies in heritage conservation and the issues involved in the digital and physical diagnosis and reproduction of an object.[51] Moreover, they help in the preservation of objects, making them available to wider audiences while adding context to little-documented collections.[52] However,

[50] Hess et al, 2017; Object-Based Learning | Academic Technologies,n.d; Kador et al, 2018
[51] Hess et al, 2017; Hess et al. 2019
[52] CAA Australasia, 2020; Turin, 2015; Object-Based Learning | Academic Technologies; Kador et al, 2018

students might not have experience in producing digital material and might struggle due to technical issues.[53]

Similarly, **reproducing the techniques of an object** (see Barlow, 2017; Woodwall, 2021; Hatchwell and Halliwell, 2021; Scholten & van 't Hoogt, 2021; the knowledgeable object, 2018; Marie, 2011) gives students opportunities to discuss how the craft was taught to new generations, and how long the tradition/style has existed while exploring the makers' intention and the object's significance.[54] For instance, Barlow recalls an Early printed books: history and craft course, where a series of workshops were organized, during which students created reproductions of early books. Students might reflect and gain new insights into historical practices, developments, and concepts.[55] Students might also be inspired by existing objects to create new ones that reflect their own experiences and incorporate personal symbols/imagery. In doing this, students will internalize underlying concepts of existing objects and transform them into personal narratives, styles, and themes.[56] Such practices not only invest students with real artisanal skills, but also leads students to have new experiences, responses, questions, and learning outcomes with objects, which they would not have had otherwise.[57] While students might become frustrated if the focus is more on the creative

[53] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020; Turin, 2015
[54] Teaching With Objects: Travelling Museum Project, 2014
[55] Scholten & van 't Hoogt, 2021; Barlow, 2017
[56] Teaching With Objects: Traveling Museum Project, 2014
[57] Barlow, 2017; Scholten & van 't Hoogt, 2021; the knowledgeable object, 2018

response rather than the object; it can also enhance students' confidence in their ability to analyze objects.[58]

To further engage learners in creative active learning, students might be asked to **curate an exhibition** with their research or (re-)created objects.[59] (see Mouliou, 2018; Kador et al, 2018; Hardie, 2015; Kreps, 2015; Krmpotich, 2015). For instance, Hardie (2015) asks first year students to create and curate the "For the Love of Graphics" exhibition. Each student was tasked with selecting a graphic design artifact or collection to showcase in the exhibition, research the object and writing a short piece to present it and inform others about their selection rationale and the provenance and context of the objects. Besides teaching students to conduct (historical) research, it also allows students to learn about and be critical of the logistics of an exhibition process and the work that goes behind the scenes in museums.[60] Curating exhibitions allows students to have a deeper level of engagement with objects.[61] Moreover, students might outreach to audiences the museum traditionally does not attract.[62] For further information on teaching with objects activities please refer to **Appendix 3.**

[58] Hatchwell and Halliwell, 2021; Marie, 2011
[59] Tanabashi, 2021, Chatterjee, 2008; Kador et al, 2018; Mouliou, 2018, Hardie, 2015
[60] Object-Based Learning | Academic Technologies,n.d.; Kreps, 2015; Krmpotich, 2015
[61] Hardie, 2015; Kreps, 2015, Mouliou, 2018
[62] Mouliou, 2018

2. Benefits and challenges of teaching with objects in different fields

In discussing different activities involved in teaching with objects, this report has begun to explore various potential teaching and learning objectives for each of them. This section will expand on some of the potential and challenges of teaching and learning with objects in different fields, according to the literature collected.

In fields such as **environmental science** and **geology**, learning is often inherently object-based and material by nature. Similarly, academic disciplines such as art history and archeology routinely work with artifacts. However, traditional learning paths in anthropology, archaeology, art history, classics, and museum studies do not often afford students the opportunity to engage directly with authentic objects until they have reached advanced stages of instruction.[63] However, using objects in these fields presents significant strengths for teaching these disciplines.

In addition to promoting the cognitive abilities of future archeologists, interacting with objects encourages students to ask themselves whether they are determined to dedicate their lives to archeology.[64] In **archeology and art history**, objects are especially useful to explain information specific to the discipline.[65] For instance, in archeology, OBTL makes it easier for students to understand and remember the different techniques, names of shapes, and special

[63] Alexis-Martin, 2020; Pollalis et al, 2018
[64] XHERAJ-SUBASHI, 2019
[65] Prown, 1982, p.7

terms for object parts.[66] In art history, objects allow students to learn about stylistic and iconographic influence, dating and authorship, quality, and authenticity.[67]

Academic studies of **art and visual culture** tend to reduce objects to illustrations of events, processes, and people and neglect the darker aspects of their histories, such as the violence of colonial conflict.[68] OBTL presents an opportunity for students to learn about the sociocultural, political and historical ideas and issues embodied within material culture.[69] Similarly, interacting with object and real-world case studies inoculate students against the kind of overtheorized critical analysis favored by the academy and offers an opportunity for students to unlearn the view of history, art, or anthropology they have learned, grappling with indigenous ways of looking at things.[70] Students might also learn to appreciate public opinions and political/funding realities.[71]

In arts and museum studies, especially in the field of **heritage conservation**, OBTL might give students an interdisciplinary set of skills at the intersection of heritage and technology.[72] Combining OBTL and new technologies can help students understand problems associated with the physical and digital diagnosis and replication of an object.[73] This is especially important as the cultural sector has

[66] XHERAJ-SUBASHI, 2019
[67] Prown, 1982, p.7
[68] McCarthy, 2021
[69] Lelkes, 2019, Ladkin et al, 2011
[70] McCarthy, 2021
[71] McCarthy, 2021
[72] Hess et al, 2019, p.3
[73] Hess et al, 2019

become increasingly dependent on digital technologies for the preservation of historical heritage and the production, display, and dissemination of art and material heritage.[74]

OBTL gives **fine arts students** opportunities to get hands-on interactions with modern and old masters collections. Students might gain new insights into past and present artistic practices and be inspired for new artistic ventures.[75] In addition to improving manual skills, designing and refining compositions, students will develop transferable skills in exhibition design, curatorial networking, and object handling, which are crucial for their future as professional artists.[76] Overall, transferable skills refer to abilities or expertise that can be transferred to a variety of contexts, for instance, communication or problem-solving.

In **social sciences**, and especially anthropology, OBTL offers students a way to undertake and co-create creative cultural research, while developing a new understanding of their own culture.[77] Similarly, OBTL helps students develop their archival and historical research skills by providing an opportunity to use primary sources as they would be bound to use archives and libraries in the future.[78] Moreover, following a path on a map based on the details of oral history is essential in improving the students' spatial literacy of their local environment.[79] OBTL also offers social sciences and history

[74] Hess et al, 2017, p.349; Hess et al, 2019, p.3
[75] Scholten & van 't Hoogt, 2021; Chatterjee & Duhs, 2010
[76] Scholten & van 't Hoogt, 2021; Chatterjee & Duhs, 2010; Gould, 2011
[77] Alexis-Martin, 2020
[78] Cobley, 2022, p.79: Object-Based Learning | Academic Technologies., n.d.
[79] Raynes & Heiser, 2020

students a safe place to enrich their perspective of the past and practice discourses of the past, present, and future from a logical thought-provoking context, locating the "real" in the stories they see in their textbooks.[80] Touching, imagining, and discussing objects allows students to gain insight into the plight of the people being studied, generating an empathetic awareness of these people.[81] These insights give participants valuable civic knowledge about current problems in our society, so closely linked to the past.[82]

Collections of clothing accessories and **textiles** can also be used in teaching the design and making of textiles, costumes, and textile history.[83] Object-based research with these objects allows students to explore crafts skills in different periods, the relationship of these skills in art and fashion, and between hand-made and machine-made objects.[84] Future textile teachers can also learn cultural history, the history of fashion and design, and learn manual skills.[85] Moreover, reverse-engineering finished garments allows the construction process to be broken down into individual steps and for the pattern pieces to be extracted from the original garments.[86]

In **linguistic** courses, students might be asked to investigate inscriptions on objects displaying ancient texts and identifying ancient scripts and texts.[87] When targeting communication skills, objects

[80] McCarthy, 2021; Griggs, 2017
[81] Griggs, 2017
[82] Griggs, 2017
[83] Tegelberg, 2011, p.175
[84] Tegelberg, 2011, p.175
[85] Tegelberg, 2011, pp.175-6
[86] Baldwin, 2018
[87] Miles, 2018

might be used to raise awareness of the importance of active listening skills in the role of a change agent and advocate.[88]

Approaches to visual material are especially conducive to the so-called **STEM (science, technology, engineering, and mathematics) disciplines** where students must acquire both content knowledge and specific skill sets, such as the ability to analyze complex visual data and to visualize otherwise abstract results.[89] In engineering, OBTL allows students to visualize certain aerodynamic concepts and acquire the knowledge that they would later use in their professional practice.[90]

One of the uses of OBTL for **medical students** in literature has been to conduct object-based research exploring the therapeutic potential of object handling and taking museum loan boxes to patients' bedsides.[91] These practices imbue medical students with patient communication skills, methods of well-being assessment, and research techniques.[92] Object-based research increases students' organization, time management, and independent thinking skills.[93] Students gain a different perspective of patient care and a first-hand experience of patient contact outside of a clinical care context.[94] In other words, OBTL gives students a space to think creatively about patient care and how they might be perceived by patients, challenging

[88] Miles, 2018
[89] Milkova, 2018
[90] Medina et al, 2011
[91] Chatterjee & Duhs, 2010, p.2; Chatterjee, 2008, p.3
[92] Chatterjee, 2008, p.3; Chatterjee & Duhs, 2010; Noble, 2011
[93] Chatterjee & Duhs, 2010; Noble, 2011
[94] Chatterjee, 2008, p.5; Chatterjee, 2008; Noble, 2011

medical students' perspective of the role of experts and doctors.[95] Moreover, such initiatives can have a positive impact on patients, increasing their perceived health and well-being, and leading to better staff-patient relationships.[96] However, students might lack communication skills and might lack experience in delivering object-based sessions with patients.[97]

Art can be especially helpful for **neurotoxicology** students to understand more deeply human and scientific discourses surrounding the impact of neurotoxins and the necessity to keep an open mind and multiple possibilities in sight when conducting a scientific or scholarly inquiry.[98] Moreover, exercises in the museum engage students' intellects, emotions, and senses alike, and further task students with teaching their peers about a concrete issue as seen through, or elucidated by, the works of art.[99]

Biology and neurology students can expand on the foundational knowledge presented in the lecture by handling, rotating, and observing objects, putting their theoretical knowledge to practical use.[100] In biology, the ability to conceptualize 3D shapes is crucial to understand biological processes.[101] Thus, 3D-printed molecules can be used as tools to stimulate engagement in group lectures while helping students better understand these molecules. By touching the teeth, manipulating the jaws and comparing the specimens to others,

[95] Noble, 2011
[96] Chatterjee, 2008, p.5
[97] Noble, 2011
[98] Milkova, 2018
[99] Milkova, 2018
[100] Smith, 2016, p. 1; Milkova, 2018
[101] Smith, 2016, p.3

students can develop insights into how biologists build up and use evidence to develop scientific theory and learn close observation.[102] Moreover, this is an effective way for students to understand how "messy" the world is and how processes of fossil preservation bias the nature of the fossil record.[103] Museum specimens can show students important evolutionary transformations and teach them about common ancestry.[104] This is especially important as creationist ideas are accepted as a viable alternative to evolution by a high number of students and teachers alike.[105] However, biodiversity research requires new types of museum collections that interface with national security issues such as human disease or ecotoxicology and involves scientists who do not typically operate within a museum environment.[106]

OBTL is also pivotal and becomes increasingly implemented in **interdisciplinary or cross-disciplinary contexts**.[107] Objects play a unique and crucial mediator role between students from different disciplines.[108] Moreover, engaging with objects outside of their core disciplines allows students to expand their knowledge in a variety of disciplines such as fine arts, natural history, and archeology.[109] However, learning about topics with which they are not familiar might be a struggle for students, and impact their engagement.[110]

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[102] Davies & Nicholl, 2017; Philips et al, 2021; Milkova, 2018
[103] Tomiya et al, 2011; Philips et at, 2021
[104] Tomiya et al, 2011; Davies & Nicholl, 2017
[105] Tomiya et al, 2011
[106] Ladkin et al, 2011
[107] Tanabashi, 2021, p.3; Chatterjee and Duhs, 2010, p.2; Kador et al, 2018, p.161
[108] Tanabashi, 2021, p.5
[109] Tanabashi, 2021, p.2; Chatterjee & Duhs, 2010; Noble, 2011
[110] Davies & Nicholl, 2017

3. OBTL tools

OBTL sessions can be complemented with various tools. Tools refer to any item that is used to assist the educator and/or student in the activities carried out during the lesson. These can be low- tech like gloves or high-tech like 3d scanners, physical equipment such as cameras or digital ones such as softwares to contribute to the digitization of objects. According to scholars, when teaching with objects, tools are primarily necessary **to document one's interaction with objects**. Among others, students might have to rely on notebooks and pencils to take notes and make drawings of objects when laptops, pens, and cameras are not allowed in some facilities.[111] Tape measures, magnifying glasses, scales, ultraviolet lamps, infrared photographs, complex electron microscopes, and ray diffraction machines can also be used **to record physical properties of objects and their measurements**.[112] Optical imaging techniques such as photography, making videos, and 3D imaging techniques can be useful methods to capture key features of objects when one has limited time to engage with them.[113] However, Mida and Kim (2015) claim that photographs and recordings should only be used as memory aids and documentation tools rather than primary research methods. While some features can be captured by a photograph or a video, it does not mean that students will know how to look for them and trust that they have been captured fully and accurately.[114]

[111] Mida and Kim, 2015, p.35
[112] Prown, 1982, p.8; Mida and Kim, 2015, p.35
[113] Mida and Kim, 2015, p.37; Hess et al, 2019, p.5
[114] Loic, 2022, p.44; Mida and Kim, 2015, p.37

Moreover, it is important to be aware of possible technical failures when using modern technology.[115] Thus, Mida and Kim claim that much more can be gained from the close observation and handling of the artifact.

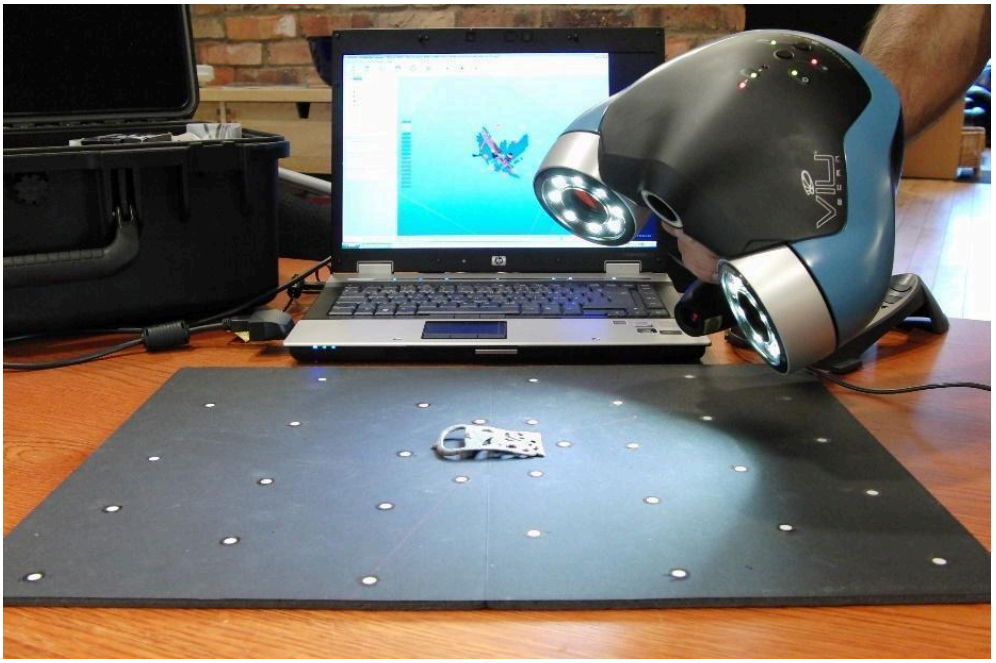

Figure 1. VIUscan handheld 3D scanner in use[116]

3D scanning (see *Figure 1*) and fabrication technologies have advanced, allowing educators to engage students in **exploring virtual or tangible replicas of original artifacts**.[117] 3D scanning can use white light or lasers to capture 3-dimensional data of objects. Hess et al (2017) mention using a Nextengine laser line triangulation scanner and "'low-cost 3D' using an Asus Xtion sensor with Skanect or ReconstructMe software".[118] Besides Autodesk products, which are

[115] Mida and Kim, 2015, p.37
[116] Creative Tools, 2010
[117] Pollalis, 2018
[118] Hess et al, 2017, p.351

freely available, students can use Rhinoceros or other CAD packages.[119] Similarly, and as an alternative, photogrammetry allows the creation of online 3D models of objects from photographs (see *Fig. 2*).[120] These images can then be used to produce 3D virtual objects using Sketchfab, a direct manipulation interface, which allows students to produce 3D virtual objects and to interact and manipulate these replicas.[121]

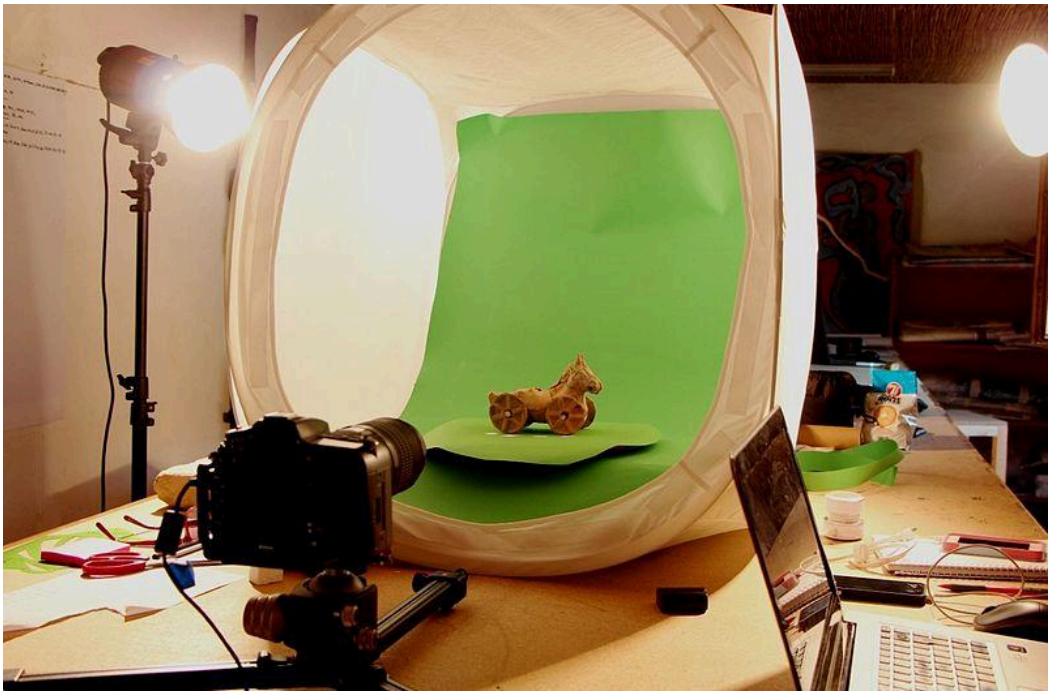

Figure. 2 Balkan Heritage Field School (photogrammetry course) at Stobi, Republic of Macedonia[122]

In comparison to other methods, photogrammetry is a more cost-effective approach as one can rely on existing resources such as one's camera of choice (e.g. DSLR-cameras) and a laptop (see *Figure 2*). Photogrammetry allows for the production of good-quality models

[119] Hess et al, 2017, p.351
[120] Object-Based Learning | Academic Technologies,n.d.
[121] Object-Based Learning | Academic Technologies,n.d.; Pollalis et al, 2018
[122] Ivan.giogio, 2015

relatively quickly with a limited number of pictures.[123] This approach is especially interesting for objects which might be too fragile, too large, or too valuable for one to interact with. However, processing large scans with many pictures can be time-consuming.[124] It is also important to note that not all objects can be captured using photogrammetry, especially objects with translucent and reflective surfaces, as this might lead to poor captures.[125]

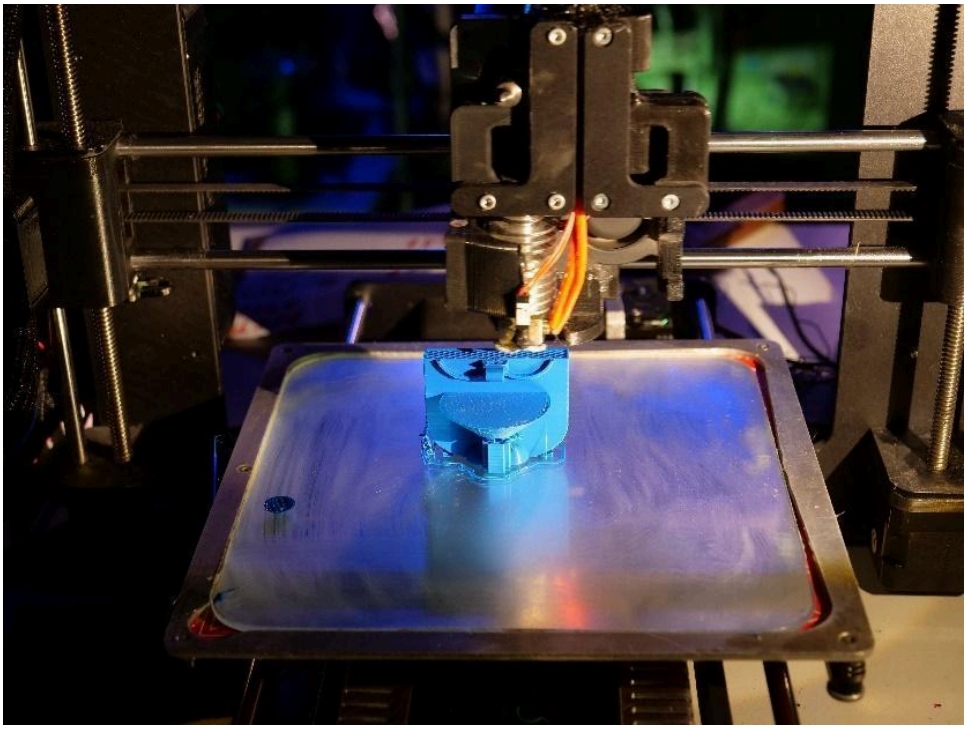

Figure 3. A 3D printer printing a blue miniature object[126]

To print 3D models (see *Figure 3*), Makerbot Mini or Ultimaker 3D printers can be used by students or teachers. Physical models have the potential to augment cognitive processes by facilitating conceptual and material manipulation. 3D prints provide multi-sensory input as

[123] Pollalis et al, 2018, CAA Australasia, 2020
[124] CAA Australasia, 2020
[125] CAA Australasia, 2020
[126] Lenz, 2019

students can manipulate them.[127] However, the quality of the prints relies on the printer used. Whereas interacting with online models can be tricky for students with sensory disabilities, 3D prints offer additional options for people who have visual impairments to engage with objects.[128] However, the absence of visual information (i.e. color and texture) on prints can hinder students' critical interpretation and contextualization.

Digital teaching resources can also be used in OBTL such as (digital) images of objects, videos, live or pre-recorded lectures, and virtual tours of the museum.[129] The digital models created with photogrammetry or 3D scanning can be hosted online via Pedestal or Pedestal 3D Team.[130] **To engage with digital replicas** of objects, students might also use Augmented Reality (AR) applications such as the Microsoft HoloLens headset (see *Figure 4*).[131] AR technology allows virtual objects to appear as if they coexist with the real world, giving students opportunities to explore the objects while present in class, and in conversation with peers and educators.[132] Head-worn AR devices such as HoloLens allow for a fully visually immersive environment replicating the scale and presence of objects. Moreover, users have recorded higher levels of enjoyment and pointed out more strengths than for SketchFab or 3D prints. However, a high number of participants reported discomfort, headaches, and physical effort.[133]

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[127] Pollalis et al, 2018; CAA Australasia, 2020
[128] CAA Australasia, 2020
[129] Davidson, 2020; Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2) ,2020
[130] Miles, 2018
[131] Pollalis et al, 2018
[132] Pollalis et al, 2018
[133] Pollalis et al, 2018

Currently, AR applications are on tablets and phones, which involve limited interactions through on-screen touch gestures. It is these gesture-based interactions with virtual replicas which lead to a superior learning process for users.[134]

Figure 4. A person wearing an augmented reality headset[135]

Instead of pre-recorded lectures, one can also use platforms such as Zoom, Teams, Google Meets and Renata in digital or hybrid OBTL.[136] Presenting **virtual sessions** might require using a high-quality DSLR camera to present objects and zoom in on them.[137] Virtual collections classrooms can also use a wolfvision EYE 14 ceiling camera.[138]

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[134] Pollalis et al, 2018
[135] Kowalewski, 2016
[136] Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2), 2020
[137] Woodwall, 2021
[138] Woodwall, 2021

4. Reflection

Overall, literature on OBTL is mostly centered around English, American, and Australia. This could be in part due to our using primarily English keywords (besides Italian and French ones) during our literature search, relying on the linguistic skill set of the project. Here by literature we refer not only to published articles and books but also videos, blog posts and other online sources, as not everyone might have published about their practices. However, it might also indicate that teaching with objects is more prominent in these countries. For instance, the renewed interest in the use of objects in teaching in the 21st century especially began in the United Kingdom and Australia.[139] The examples of OBTL practices found in the literature were also more prominent in certain fields such as archeology, museum studies, or biology while we could not find any sources on OBTL practices in mathematics or chemistry. This could be explained by the fact that traditionally, OBTL has been limited to specific disciplines such as archeology, science education, and museum pedagogy before being expanded to disciplines in the STEM fields.[140] Similarly, teaching with objects mostly began to take place in online and hybrid contexts due to the Covid-19 pandemic, which is much more recent in the history of teaching with objects. This could explain why most of the sources collected presented teaching with object practices taking place in presence. Another potential

[139] Chatterjee, 2011, p.179; Adams, 2015, p.89; Tanabashi, 2021, p.2; Object-based learning (OBL) in Higher Education: Fuma. Flinders University, n.d.; Kreps, 2015,p.96; Causey, 2022, p.78

[140] Tanabashi, 2021, p.2-4; Chatterjee and Duhs, 2010, p.2; Prown, 1982, p.7; Mida & Kim, 2015, p.12;Paris & Hapgood, 2002; Chatterjee, 2008

explanation is the seeming agreement that physical objects are better than using digital representations as students are more engaged and retain knowledge longer.[141] However, teaching with objects in digital and hybrid contexts also has benefits. For instance, it enables sensory practices and activities that could not be done in an academic/museum setting.[142] Moreover, the digital allows the exploration of new forms of collaboration and teaching that might be more creative, more subversive, and more equitable.[143] For instance, according to Filipowska & Milkova (2013) online practices have the potential to contribute to equity and belonging and address issues brought up by the pandemic but also larger systemic, institutional and interpersonal racism. Finally, we could find little information about students' experiences, inclusivity, and digital accessibility when it comes to teaching with objects. For instance, Lelkes (2019) and Filipowska & Milkova (2013) were the only two articles we have found on inclusivity in regards to OBTL. In that regard, Lelkes (2019) has also argued that the inclusive potential of teaching with objects is not realized.

Through our research, we have aimed at bridging several of these gaps present in literature, by investigating primarily European practices through interviews complemented with observations, allowing us to explore teachers' and curators' but also students' perspectives. In our sampling, we have tried to collect diverse

[141] Bunce, 2016; Ducady, 2016; Hardie, 2015 ; Thogersen et al, 2018 ; Smith, 2016; Cobley, 2022; Pollalis et al, 2018; Simpson & Hammond, 2012; Xheraj-Subashi et al, 2019
[142] Woodwall, 2021
[143] Turin, 2015

examples with regards to the fields in which lessons were taught but also by exploring digital and hybrid examples. In addition to focusing on collecting specific examples of lessons, this research has also aimed at exploring how teachers and curators have worked towards making their practices inclusive and digitally accessible.

IV. Methodology

*This section will expand on the methods used to collect teaching with objects practices, namely interviews (see **section 1.1**) and ethnography (see **section 1.2**). Finally, this section will introduce the key aspects of teaching with objects we have focused on during this data collection.*

1. Data collection and elicitation

1.1 Interviews

We have conducted semi-structured qualitative interviews with educators and curators who teach with objects to (1) learn more about the potential and challenges of OBTL in different fields and (2) collect methods, tools, and examples for teaching with objects. Organizing (pre-)workshops at the XXIIe Annual meeting of Universeum in Belgium (July 5-8 2022) allowed us to get in touch with and identify potential interviewees. We have also created an online survey to get to know OBTL practitioners and further identify participants for our research.

When selecting interviewees, we have tried to collect diverse practices with regards to

- the discipline,
- whether practices took place in digital, hybrid or in presence settings,
- the country where the practice was taking place,
- and the position of the interviewee (whether they were an educator or a curator).

All selected interviewees were made aware of the aims of this project and were asked to sign a consent form.

In parallel, we created a topic guide with a series of themes and open-ended questions, which aimed at exploring one teaching with objects example or practice in depth for each interview **(Appendix 1)**. We started with three interviews with project partners who have experience teaching with objects. This not only allowed us to gather preliminary data for the analysis but also to test the topic guide and further improve it (McGrath et al, 2019).During the interviews, we moved freely through the guide based on interviewees' answers and the topics they brought up. Interviewees were also free to pick which example to focus on based on their interests and preferences and in relation to that of the project. The interviews took place through Zoom and were conducted in English by a moderator accompanied by a note-taker **(Table 1)**.To have a complete account of the interview, automatic transcriptions and recordings were collected.

Table 1. List of interviews

Interview number	Country where the lesson took place	Date of the interview	Duration of the interview
1	France	13/07/2022	1h55
2	The Netherlands	22/07/2022	1h25
3	Belgium	08/09/2022	1h13
4	The Netherlands	09/09/2022	1h07
5	Scotland	13/10/2022	55 minutes
6	The Netherlands	02/11/2022	1h18
7	Scotland	09/11/2022	45min
8	India	20/12/2022	1h14
9	France	20/01/2023	1h12
10	Germany	31/01/2023	1h13
11	Canada	09/02/2023	1h05
12	Italy	14/02/2023	1h04
13	Germany	15/02/2023	56 min
14	US	16/02/2023	1h22
15	Portugal	22/02/2023	2h

16	UK	27/02/2023	1h20
17	Germany	13/03/2023	1h11
18	Turkey	20/03/2023	35 min
19	UK	29/03/2023	45 min

1.2 Ethnography

Ethnography is a method, which involves researchers' participation (overtly or covertly) in people's daily lives for an extended time, watching what happens, listening to what is said, asking questions.[144] Within the project, we have conducted ethnographies in the form of observations followed by an online survey to explore students' experiences of teaching with objects lessons. For each observation, one of the project researchers attended a lesson involving the use of objects, focusing on the lesson itself, the location, and students' behaviors **(Annex x).** In this context, participation was overt as students were made aware of the presence of the researcher and the aims of the study. The researcher did not take part in the activities with students except for observation 3. After the end of the lesson, students were asked to fill out a survey to get a better sense of their own experiences of these practices. Each observation ended with a short discussion with the educator who gave the lesson to gather their insights and ask additional questions the researcher might have.

[144] Walsh, 2012, p.246 -8

Table 2. Observations

Number of the observation	**Name of the institution**	**Date of the observation**	**Duration of the observation**
1	Things That Talk	18/11/2022	2h
2	Allard Pierson	21/11/2022	2h
3	Ghent University Museum	12/12/2022	3h
4	Boerhaave Museum	22/02/2023	3h
5	Allard Pierson	23/03/2023	3h
6	Université de Liège	23/10/2023	2h
7	Boerhaave Museum	30/10/2023	3h

2. Researched aspects of OBTL

As the project was especially interested in collecting methods, tools, and examples, interviews and observations focused on the methodological structure, the body of rules underneath the practice, and the tools used during the lessons. The objects used, the purposes of teaching and learning with objects, and the environment in which

the lesson took place were also at the center of the research. As teaching with objects is a student-centered pedagogy, we also were interested in students' perspectives and experiences of the teaching with objects practices collected but also OBTL in general. Regarding digital and hybrid practices, digital accessibility was explored. It refers to the practice of making websites and digital tools perceivable, operable, understandable, and robust for as many people as possible. Finally, we investigated the inclusivity of OBTL practices, namely, the extent to which they provided equal access to opportunities and resources for people who might otherwise be excluded or marginalized. Here, inclusivity also refers to the extent to which sociocultural issues and difficult knowledge (e.g. colonialism, racism, etc) are addressed during OBTL lessons.

V. Findings

In this section, we will expand on the findings from the interviews and observations conducted. ***Section 1*** *will begin with a general overview of the mode of delivery of the teaching with objects practices of our interviewees.* ***Section 2*** *will reflect on the tools used during lessons. The preparation and methodology of the teaching with objects examples collected will be expanded upon in* ***section 3*** *and* ***4****. Finally,* ***section 5*** *will expand on the benefits and challenges of teaching with objects in different fields according to OBTL practitioners we have talked to.*

1. In presence, digital, and hybrid

One of the main aspects we have explored was whether the examples chosen by our interviewees took place in presence, or in digital or hybrid settings. Interviews have confirmed the data collected from the literature, as participants have predominantly conducted **in presence** (see *Figure 5)*. Most of our interviewees have complemented their lessons with digital representations of objects (Interviews 2, 3, 4, 5, 6, 7, 11, 12,13, 15, 16, 17, 18, 19, observations 1, 2, 3, 5). All of them use digital tools [145] for a variety of reasons (e.g. to show and analyze objects, give instructions, create an output, collect information, and so on) (see section 2). However, the use of digital representations and tools does not mean that the mode of delivery of their lesson is digital or hybrid as they took place in a physical setting where students predominantly interact with physical objects. Practices become digital and/or hybrid when the physical becomes impossible (i.e. during the Covid-19 pandemic, in case of strikes and earthquakes, and during museum renovation phases). After these events, almost all lessons reverted to in presence mode of delivery (Interviews 1,2,34, 6, 8,9,10,11,12,13), Remote teaching impacted their in presence lessons after the pandemic, as educators and curators incorporated tools and activities which they used in their digital and hybrid lessons, in presence. For instance, during the pandemic, interviewee 5 asked

[145] Digital tools refer to any kind of commonly-used digital equipment/apparatus (for example: computers, smartphones) or to specific instruments (such as digital microscopes , visualizers and so on).

students to recreate recipes from home. She then decided to incorporate this activity in her in presence lessons.

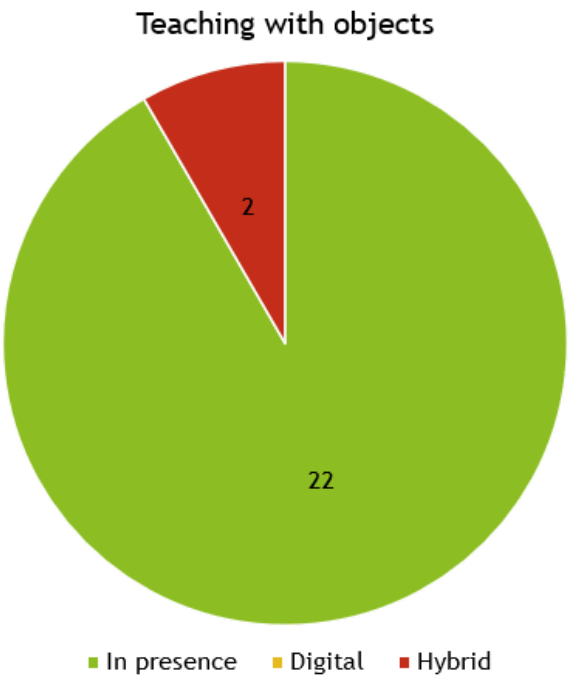

Figure 5. Pie chart illustrating modes of delivery of interviewees' practices

While most of the interviewees kept teaching during these extraordinary events, some of them (Interviews 4, 10, 11) did not give their lessons during the pandemic. According to interviewee 4, showing objects online is not a good solution as students could not interact with physical objects. Similarly, interviewee 10 claims "We are addressing aspects such as skills, technology. And you can't just transfer that into the digital materiality plays a key role you can't transfer that into the digital." Moreover, according to interviewee 5,

hybrid formats are especially difficult and exhausting to hold for the teaching staff and chaotic.

The physical dimension of in presence lessons is deemed crucial, however, in reality, the ideal situation is not always implemented. While physicality and physical interactions are presented as one of the main added values of OBTL, in reality, students do not always have the opportunity to touch objects (e.g. interview 3, 5, 14) or are reluctant to touch them even when given the opportunity (e.g. interview 2, observation 5). On the other hand, sometimes, physicality can be present in digital settings as students could be invited to interact with everyday objects from their homes (e.g. interview 6) or could be given 3D printed replicas of original instruments to experience all their senses (e.g. interview 18).

Although challenging for both educators and students, **digital and hybrid** approaches are especially valuable when it comes to showing inaccessible objects or objects too fragile to be touched (Interviews 2,5,14). Such modes of delivery might also allow wider audiences to be reached. Interviewee 14 claims that “Digital teaching allows for a more equal access to the objects, since everyone sees the image more or less the same way, whereas in person some stand in the back, others view the work from the side, etc.” Being able to join online could further offer more flexibility for students to join the lesson even during their commute (Interview 5). Moreover, it creates a safer environment for students who experience shyness or anxiety

from in person encounters, allowing them to take a more active role (Interview 14).

2. Tools

Definitions of tools vary widely from interviewee to interviewee. While some focus on high-tech tools, others incorporate low-tech tools. For instance, **low-tech tools** could be gloves to manipulate objects (Interviews 4, 9, 16, 19), notebooks and pens (Interviews 4, 14), screwdrivers to open objects (Interview 8), tools to measure and weigh objects such as tape measures, calipers, and balances (Interview 2). **High-tech tools** can be examples, smartphones and cameras (Interviews 2, 3, 5, 8, 10, 13, 15), visualizers (Interviews 1, 5), 3D scanning tools (Interview 3, 11, 19), UV torches (Interview 15), or online databases and platforms (Interviews 1, 2, 6, 7, 9, 11, 19) for example. Overall, tools are predominantly used (1) to show/observe objects during the lesson itself, (2) for students to create an outcome (e.g. online exhibition, etc), and (3) to share information and documents (see *Figure 6)*.

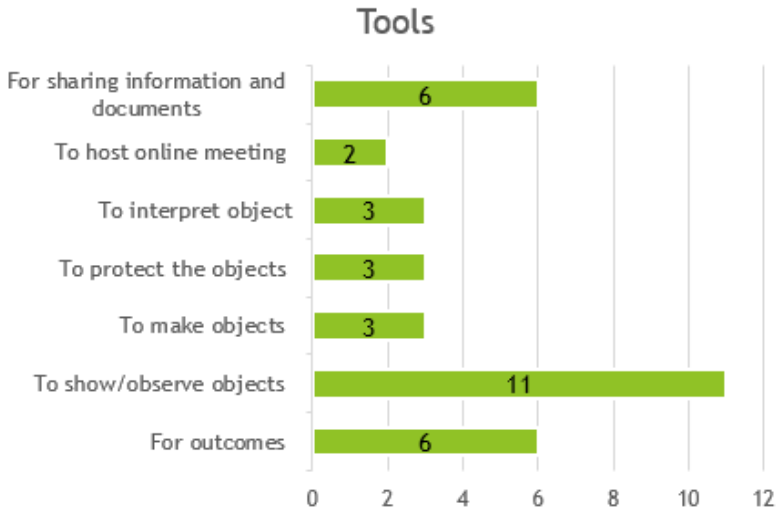

Figure 6. Chart illustrating the tools used

2.1 Tools used by students

While **tools to observe and show objects** vary from low to high tech, the latter is preferred, especially, camera/smartphone (e.g. interviews 2, 3 5, 13). Nowadays, most if not all students have a smartphone equipped with a camera, so asking them to use their own device makes it somewhat digitally accessible. Cameras can be used regardless of internet connection and are not overly complicated to use. Moreover, there is no need for them to bring additional equipment for the lesson. Pictures can be uploaded and shared very easily without any specific software. Students feel comfortable with their own devices, as they are using tools they are familiar with. However, this is not always straightforward. For instance, interviewee 2 mentions, “We always have workshops. (…) Typically a lot of students. (…) start trying to build a story with the object and then they will fool themselves by just zooming in on random, random points on

the object, just to make sure that they can write their paragraphs and move to the next step." Moreover, it is important to note that students will have different phones with varying picture and video quality. Students might also have different abilities when it comes to taking pictures and videos.

Students also used tools to create outcomes. Audio and/or video files are usually accepted; any kind of document posted on social networks like Facebook, Instagram or other online platforms such as Canva, Flickr, and HotorNot (Interviews 1, 2, 6, 9, 11, 19). Students are often encouraged to use tools available to them, and rely on their previous knowledge (Interviews 1,6, 9, 10). Thus, these practices account for diversity in students' skills and the tools that are accessible to them. However, students might have varying circumstances and access to various tools. It is crucial for educators to not take tools for granted and adapt and contribute to making tools available for students. This means creating a safe place to discuss (individually) with students what tools are available to them and possible solutions so that students are not disadvantaged in their assignments.

2.2 Tools used by educators

Students are not the only ones using tools. **For sharing instructions and documents,** common online databases like Google docs and other open-source databases, were used by educators (Interviews 5, 6, 7, 11, 13). Often this relies on the institution's platform. Every student

with a connection can easily get the information and share their own data.

Educators might also use cameras to **show images of objects** to students (e.g. interview 5) or microscopes to show enlargements/details of the objects (e.g. interview 3). **Tools can also be used when preparing a lesson**. For instance, interviewee 3 reflects, “If I want that object and I can’t get it, Then, most probably I would make it myself. (…) I can print it.” The creation process of replicas is often time-consuming and expensive, interviewee 18 was able to make a 3D-printed replica for each student. Alternatively, students might be invited to make their own replicas as part of the OBTL lesson (Interviews 10, 13, 18).

The Covid-19 pandemic has led educators and curators to use new tools in their practices. For the **online meetings** that were mainly implemented during the Covid-19 pandemic, common and easy-to-access communications platforms and video conferencing services such as Zoom and Google Meets were used by educators and students to connect (e.g. interviews 1, 2, 4, 5, 6, 7).

3. Lesson preparation

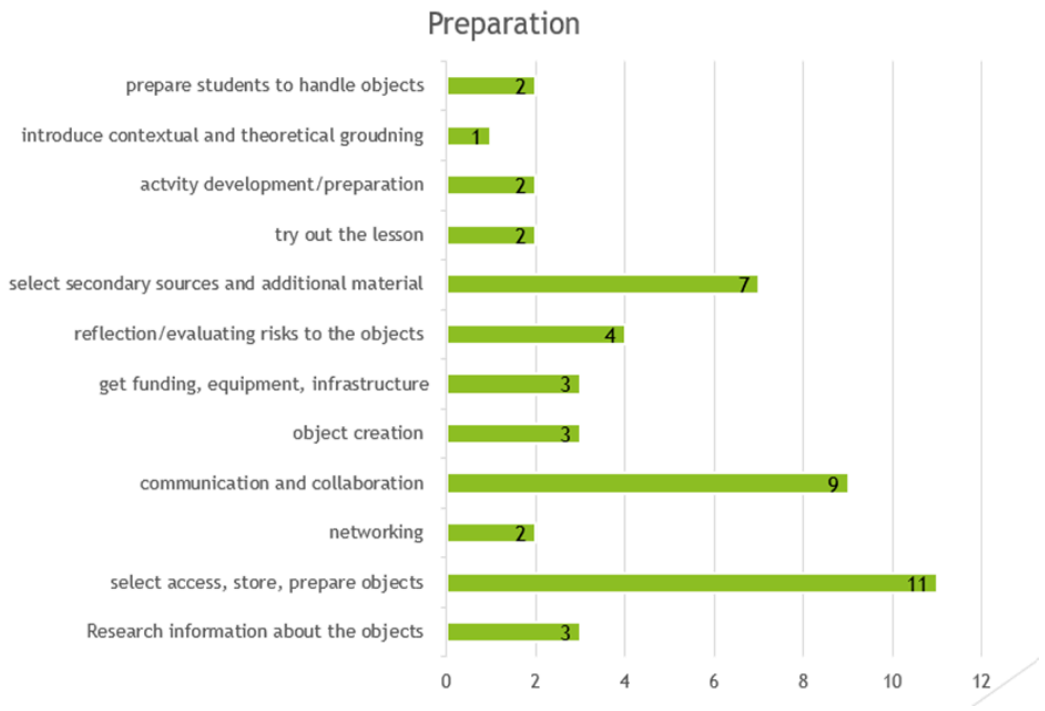

Figure 7. Main steps involved in the preparation of OBTL lessons

Interviewees were asked to describe the main steps they took to prepare their lesson. As illustrated by the chart (see *Figure 7*), one of the most important elements before carrying out a teaching with objects lessons relates to **the selection, access, storage, and preparation of objects**. For interviewees 3, 16 and 18, this means creating the objects themselves (or asking a third party) as their lessons rely heavily on the use of replicas or do so when the objects they want to use are not accessible.

Most of our interviewees have also mentioned **researching and additional literature** to give students before the lesson (e.g. interviews 1, 6, 19). However, collected sources and secondary

material are not always shared with students as activities might rely on a knowledge gap about the objects (e.g. mystery object activity). For instance, participants from interviews 2, 15, and observation 4 highlight that they prefer for students to engage with objects outside of their field of knowledge. This allows students to “hone in different skill sets, and really think of how they can approach something like that. (...) So it pushes them outside of their comfort zone, and really makes them work on engaging with that thing they can't retreat into what they already know. (...) Then they need to think completely outside of that disciplinary framework.” (Interviewee 15). Not all interviewees researched objects either. Interviewee 8 and 15 have highlighted that educators’ lack of knowledge about objects can be beneficial. Interviewee 15 claims

“You don't need to be an expert in everything that you teach, (...). Knowledge and understanding in life, experience, and as long as you have the skills, and that's the key is actually working on those skills, facilitating the students, engaging deeply with these things rather than looking for the answer.”

In other words, educators should not give students the answers but facilitate students’ exploration of questions. Similarly, two of our interviewees (interview 2 and observation 4) claim that they do not prepare the lesson, meaning that they do not research the objects themselves or rehearse what they will say. For the curator of observation 4, lack of preparation is a way to push students to

generate their own knowledge and findings from firsthand interaction with objects instead of finding and receiving organized and easily accessible information from the educator. While encouraging students to generate their own knowledge is a key aspect of teaching with objects, it can also be frustrating for students, who often consider the educator as the main holder of knowledge. For instance, during observation 4, the curator would sometimes answer "I don't know" to students' questions about the objects. This seemed to frustrate some of the students, as in the survey, they mentioned they wanted to learn more about the objects, and wanted the educator to answer their questions. Similarly, during observation 2, one of the students had the impression that the educator had made a mistake when talking about an object, giving the student the impression they knew more than the curator who gave the lesson. As a result, the student became hostile and disengaged from the lesson. "Lack of preparation" contrasts with other interviewees who test their activities and whether the objects they use work before giving their lesson (e.g. interviews 9) and reflect on the extensive preparations teaching with objects requires. Despite their claims, it is important to note that not preparing a lesson is impossible. For instance, interviewer 2 mentions accessing objects and networking as relevant activities.

Preparation also relies on **collaboration and communication** with colleagues, technicians, curators, and conservation departments for accessing objects, preparing the lesson, organizing visits and planning meetings, or assigning tasks (Interviews 1, 4, 5, 6, 7, 8, 9,

14, 15; observation 4, 5). This collaboration and communication can also take the form of networking with curators and cultural institutions to facilitate object access (Interviews 2,6). However, this collaboration does not stop at preparing one's lesson. While teaching with objects, different people will take on different tasks (e.g. introducing theoretical grounding, giving workshops with objects, and so on) (e.g. Interviews 1, 6, 7, 9, Observations 4, 5). This shows that most of the time, teaching with objects is not something that one does alone.

Some interviewees highlighted the importance of organizing **a dedicated meeting on how to handle the objects and tools** (Interviews 2 and 15). This activity is organized to mitigate possible risks associated with the handling of objects. Some interviewees even take time to **reflect** on whether there is value in using objects for specific lessons or whether a standard lesson would be enough (Interviews 4, 7).

4. Methods

Overall, the methodology of the examples collected share similar steps. **The main elements of the lessons** are

- an introduction,
- lecture(s) expanding on the theoretical background/context,
- a practical part that includes
    - a visit to an exhibition/collection,

    - interaction with objects,
    - a discussion,
- the creation of an output,
- and a final evaluation.

However, not all interviewees follow all these steps. For instance, some lessons will only have an introduction followed by an interaction with objects (e.g. interview 3), and others, a practical session with objects and an excursion to a collection (e.g. interview 8). Similarly, the order in which these steps are followed varies from one example to another. An educator might start with an introduction and theoretical session (e.g. interview 1, observation 5), and another might begin with a practical session, followed by an introduction or theoretical lesson (e.g. interview 2, 18). The steps mentioned above can go over one session (e.g. interview 3, 14, 18, observation 4) or several of them (e.g. interview 8, 15, 19). Sometimes, there is only one interaction with objects activity (e.g. interview 3, 5, 7, 10), sometimes there are several practices with objects (e.g. interview 2, 6, observation 4, 5).

Introductions to lessons focus on providing students with general information on the course/lesson and its agenda and explaining how to handle and observe objects or how to use tools. According to interviewee 1, “The first session, we announce the planning to make them feel confident and so that they are not afraid of the originality of the format and the lesson. To make everything really clear. It is important to share with them from the beginning, otherwise

they get lost really fast". This is echoed by one of the students in the survey, who claims that the instructions they received online did not match what happened during the lesson, leading them to struggle.

4.1 Practical sessions

For several of our interviewees, the interaction with objects takes place in the collection or museum or involves an excursion to an exhibition, workshop, lab, or museum (e.g. interview 4, 6, 8, 11, 12, 14, 19, observation 5). **The space where the lesson takes place** can have an important impact on students' overall experience and enhance the emotional connection to the object and the lesson, leading to a more profound appreciation and understanding of the contents (Interviews 6, 11, 15).

Going to a collection or exhibition breaks with the experience of a classroom, pushing students out of their comfort zone, encouraging them to touch and engage with objects, triggering creativity (interview 6, 14). Moreover, being in a gallery or museum can have a positive impact on students' well-being (Interview 11, 14).

Either in the class or in a museum, during the practical session, **students interact with one of several objects while accomplishing a set task**. The tasks students are asked to accomplish can be as simple as discussing the objects or answering questions. In the practices collected, students have also been asked to conduct research about objects (e.g. 1, 10, 11), curate an exhibition (Interviews 7, 15), create online content (Interviews 1, 9) or a story/narrative about an

object (Interview 2), or (re)create instruments/objects (Interview10), recipes (Interview 6), experiments (e.g. 12, 13) or a scene from a painting (Interview 14). More rarely students have been asked to identify bones from skulls (Interview 3) or draw objects (Interview 6). Drawing has been highlighted as a useful analytical tool when engaging with objects, as it forces students to slow down and helps them think more critically about the objects themselves (Interviews 6, 11). Though, it is rarely used in our interviewees' practices.

All the activities described above can be done separately, but more often they are combined. For instance, to curate an exhibition, students might need to discuss an object and conduct research (Interview 1). Moreover, if the exhibition is online, students will have to make online content (Interview 1, 7, 15).

It is interesting to note that object-based teaching often requires **students** to **work in groups** at least once during the lesson (Interviews 1, 2, 5, 6, 8, 9, 11, 13, 14, 15, 18, 19). This not only increases engagement but also allows students' strengths to complement each other in activities (Interviews 7, 8). Moreover, students can learn from one another's perspectives, experiences, and sensitivities to the objects, putting themselves in each other's shoes and engaging with ideas from a different point of view (Interviews 1, 9, 14, 15). Students also develop inter-professional skills (Interview 9). Group work allows them to progress at their own rhythm, allowing teachers to take less of a "knowledge giver" position (Interviews 7, 18). According to interviewee 1, this could contribute to inclusivity

and developing empathy. She has reflected that students who have worked in groups with a hearing impaired student played a crucial role as facilitators for this student. However, interviewee 7 claims that "group learning experiences can be deeply traumatic for some people who want to be on their own".

4.2 Inclusivity

When it comes to **how they make their lessons inclusive**, several of our interviewees highlight the importance of adapting to the situations as they emerge and figure out with the concerned individuals what would be most helpful for them (Interviews 1, 3, 10). Only interviewees 6 and 14 were more proactive. For instance, before their lessons, they contact students and/or educators asking about special needs they might have, and preferred pronouns to accommodate them as best as possible, creating a safe place for students. During lessons, interviewee 14 highlights, "We never assume that everybody will be able to climb the stairs. (…) We always default to taking the elevators when we're moving any kind of group in the gallery". Moreover, walkers, and stools are made available in the gallery for those who need it (interview 14, observation 7). This shows that working towards making OBTL more inclusive and accessible does not only fall on teachers and curators but also institutions.

Inclusivity also means addressing sensitive knowledge associated with the objects. Interviewees disagree with regards to the potential of using objects to address these topics. Some (e.g. interview

4) have claimed that objects are not needed to do this, as a PowerPoint with images might be enough. Others (Interview 2, 7, 15) argue that objects allow them to address these themes in a way that is less confrontational.

Overall, **inclusivity seems to be a challenge** for our interviewees. Interviewee 7 reflects “I think what I've done has been weak”. Interviewee 9 reflects that she is unsure of how to address and handle ethical questions associated with objects such as human remains. While several of our interviewees have claimed to address the objects themselves and their contexts, it is important to note that merely brushing over these topics is not enough (Lelkes, 2019). It is also important for educators and curators to encourage students to reflect on the wider sociocultural issues in their field and on their own institutions and practices (Lelkes, 2019). When it comes to equal access and opportunities, projects aiming at developing skills in an accessible way have been abandoned (Interview 18). Similarly, interviewee 9 claims, “I find it difficult to situate the students and to assign them with a certain identity. So how do you decide that this person we will need a different, you know different narrative about this object? (…)” (Interview 9). It is interesting to note that when addressing providing equal access and opportunities for students, interviewees (e.g. 1, 3, 8, 10, 12, 14) primarily think about students who have disabilities, overlooking a wide range of other students who belong to marginalized groups. Several of our interviewees have also mentioned that they did not have encounters where they had to adapt

their lessons (Interview 4, 8, 10). This has shown that much needs to be done when it comes to making practices more inclusive.

4.3 Output creation and evaluation

Lessons often result in the **creation of some form of output**, ranging from exhibitions, online materials, or objects, often accompanied by a presentation explaining what students have done and their findings (Interviews 1, 8, 9, 10, 11, 12). In addition, it is not rare for students to have to write reports or articles (Interviews 7, 8,11, 10, 13). Most often, these outputs are evaluated. However, while students might have to write a report or essay as part of the wide course, the teaching with object lesson itself does not always involve students' creation of an output and this creation is not always graded (Interviews 2, 4, 8). Evaluation can sometimes restrain educators' freedom in how they structure their lessons or cause students to overtly worry about their grades, impacting their engagement with the lesson. Interviewee 1 has reflected "We also feel that the students are very worried about the grades they will receive at the end when they are offered a slightly different pedagogy based on objects, it's not a lecture, they say to themselves, 'but how I will be evaluated at the end ?'". Thus, she cannot be too creative in the activities she asks her students to do (e.g. asking them to recreate the position of a sculpture), as the OBTL format is new for students and already a lot for them to get used to. Interviewee 12 claims that not grading students' presentations allows them to speak more freely and not obsess over the fact that their

experiment should work. Even more so as sometimes, failed experiments are the ones that allow students to learn the most.

After the lesson, interviewee 5 also asks **students** to **reflect on the OBTL activity** and share their reflections. Moreover, after the session, they have a feedback moment with the educators involved in the lesson, to reflect on how the lesson went. When it comes to getting students' perspectives on lessons, interviewees ask students to answer surveys (Interviews 2, 5,19), to write a self-reflection assignment (Interview 13), or ask students through discussions (Interviews 2, 15). However, for surveys and discussions, half of the students tend to not answer or say that everything is fine (Interviews 2, 5, 19). This could be due to students' not feeling safe in sharing their honest opinions on the lessons with their educators. Moreover, interviewee 2 mentions that surveys are set up forms, which he has no say over. Overall, interviewees mostly get students' perspectives by looking at their reactions during the lesson (e.g. interview 2, 8). Regardless of the method, means to get students' perspective have been disappointing and do not allow our interviewees to get a sense of individual students' experiences (Interview 7). This can be illustrated by the fact that most of the time, when asked about students' perspective, interviewees limit themselves to general statements such as "students liked it" or "they had fun". Thus, it becomes necessary to explore new ways to give students a voice to express their views and experience to improve teaching with objects lessons, even more so as

the collection of feedback is a powerful tool to finetune OBTL lessons.

Overall, interviews and observations have highlighted that teaching with objects is incredibly **time consuming and requires a lot of preparation**. Interviewee 2 also reflected that when students have no or little experience with objects, several OBTL lessons might be necessary to allow students to become comfortable with the objects and the format of the lesson. Even if educators and curators invest time and effort in preparing and giving OBTL lessons, they do not always have the **student engagement** that they would like to have (Interviews 1, 4). Interviewee 4 claims that overall when teaching with objects "One third of the students are really engaged, one third are somewhat engaged, and the last third is less or not engaged in the lesson. Sometimes, there is not a third of students engaged, making the lesson more difficult for educators/curators".

Even if not all students are engaged, object-based lessons seem to be **more fun and engaging** for students but also educators. Several of our interviewees have claimed that teaching with objects was fun for them (Interviews 1, 2, 3, 6, 8, 9, 13; 18; Observation 4).
In addition to teaching educators new things (Interview 2), our interviewees have enjoyed seeing students get excited over specific tools or overcoming challenges and creating something new (Interviews 1,14). Interviewees have also reflected that students enjoyed lessons and had fun (Interviews 1, 2, 3, 6, 7, 13, 14, 16, 19). This seems to be echoed by the students who filled out our survey as

they all claimed they enjoyed the lessons and that their favorite part of it was handling objects. Students have also expressed an interest in learning more about objects. However, it is important to note that not all students who attended observed lessons filled out our survey.

5. Teaching with objects in different fields

The examples collected took place both in scientific fields or humanities going from biology to art history, including medicine and law (see *Figure 8*). OBTL lessons were more prominent in history of science and museum studies. This could be the result of our sampling, which was done using our project team network. It can also be explained by the fact that, historically, teaching with museum artifacts has been limited to disciplines such as psychology, archeology, science education, and museums pedagogy before being extended to other disciplines in the STEAM fields.[146] It is interesting to note that while examples collected take place in specific fields, most of the interviewees taught with objects in more than one field (Interviews 1, 2, 3, 4, 6, 7, 11, 14, 15).

[146] (Paris & Hapgood, 2002; Tanabashi, 2021, p.2-4)

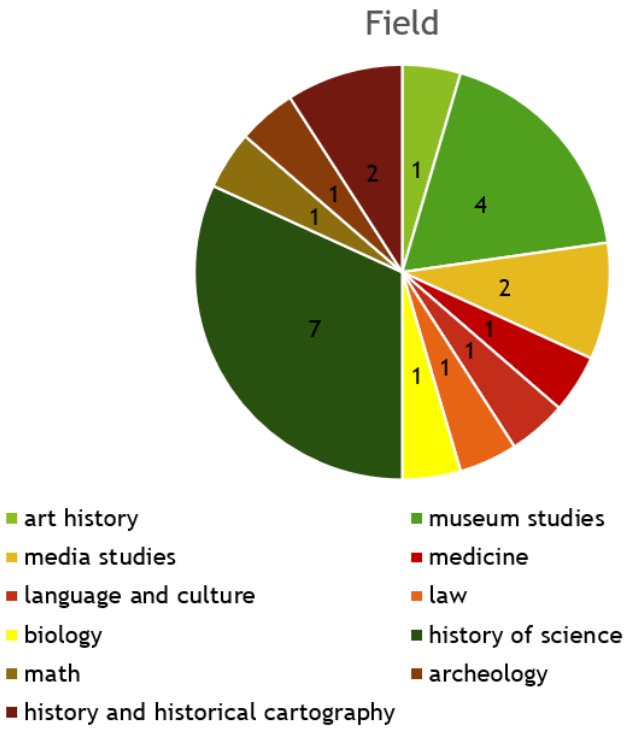

Figure 8. Fields of teaching with objects: examples collected

Overall, **regardless of the field**, OBTL is especially valuable to impart (1) specific knowledge, (2) transferable skills, or (3) insights about objects (see *Figure 9*). Students can get a basic grounding and introduction to a specific topic or develop their interest and knowledge in a field (Interviews 5, 7, 12, 13, 16). Objects are also important to help students develop knowledge and critical perspectives of the world (Interviews 6, 15). According to interviewees, students can learn logical and critical thinking (Interviews 1, 2, 3, 7, 9, 11, 15), communication, and collaboration (Interviews 1, 2, 5 ,7, 9, 11, 14, 15), and observation (Interviews 1, 3, 14, 15), and to be more open to different perspective and experiences of things (Interview 2, 8, 14, 15, 17). Students can also develop

important values such as resilience (Interview 7, 10), respect (Interview 2, 6), and morals (Interview 3). Finally, OBTL can be used to teach students about objects so that they become more familiar with them. This often is tied to how to handle and analyze them (Interview 2, 7, 8, 18), learning about their diversity (Interview 5, 7, 16), the social context in which they are made and used (Interview 4, 7, 19), and their materiality and what materials can afford (Interview 6, 7, 19).

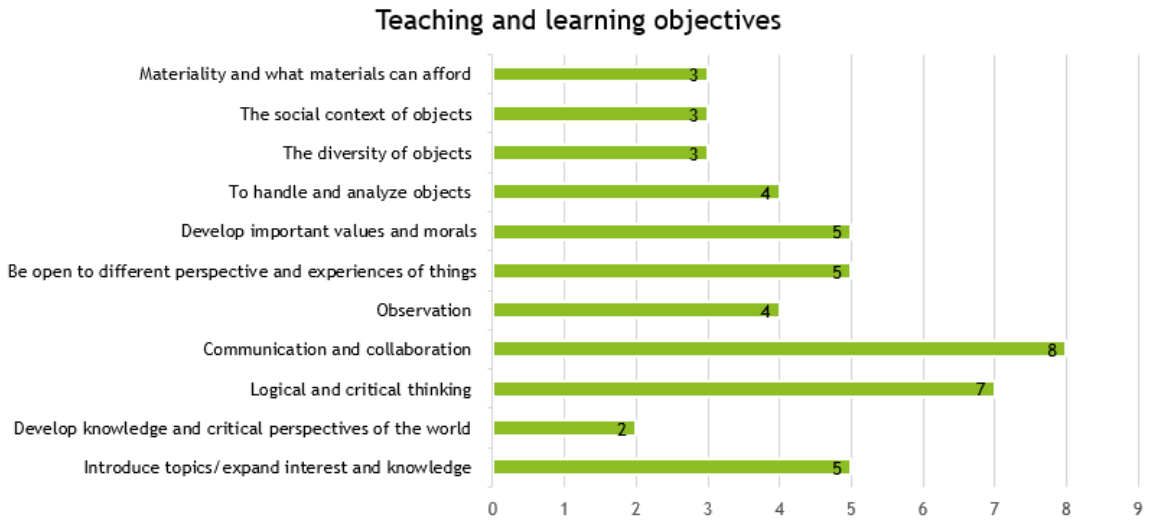

Figure 9. Main teaching and learning objectives

In many fields, teaching remains theoretical and students do not often have opportunities to engage with objects or only with fake or copies (Interview 2, 8, 15). Similarly, interviewees 1, 9, and 13 reflect that their history of science lessons are often the first and only time

students engage with objects. Thus, OBTL is invaluable for students to **become familiar and to learn to work with objects**. However, due to their lack of familiarity with an object-based model of teaching and learning, students might not be receptive, hold back or become frustrated (interviews 2, 9, observation 5). Moreover, in language and culture classes students tend to deal with objects as they would text, overlooking objects' material properties. For instance, interviewee 2 reflects, "They were only focused on text only looking at (…) the inscription (…) not on the paper, not on the colors or the bindings". However, this can be used as a learning goal, as interviewee 2 aims at teaching his students that objects are also texts and that there are different approaches to history and objects. Interviewee 14 has a similar approach when teaching thoracic surgeons, encouraging them to engage with visual art in the same terms as they would objects.

OBTL allows students to have experiences and gain competencies, which will be important for their future careers (Interview 4, 10, 19). In conservation, museology, archeology , art and history, it is crucial for students to **learn about the materiality of objects and the material world** (Interviews 4, 6, 10, 11, 19). Similarly, OBTL allows art students to learn what the materials can do, and what kind of meaning these materials and techniques are contributing to the work of art. Through their engagement with objects, students have opportunities to explore and understand that there is always interaction or dialogue between the maker and the materials and the techniques and tools. Experiencing techniques

allows students to better understand the processes involved in their creations (Interview 6). This is especially important, as in artistic fields, objects tend to be seen as representations of something rather than as things themselves. According to interviewee 11, engaging with objects allows students to understand how the material world is loaded with ideas, agendas, and ideologies and how the world and objects shape their experiences commercially and aesthetically. Moreover, it encourages them to look for knowledge elsewhere than on the internet, as "99% of all knowledge is not on the Internet. It's in these strange places, (…) [in] all kinds of collections" (Interview 11).

Often, students can **gain work experiences and insights into their future career.** For history (of science) students, working on exhibitions and outreach is a first work experience, which might help them get hired later (Interview 1). Museology and conservations students can get insights into how to work with objects, prepare exhibitions, how to conserve, repair, and care for these objects, among others (Interview 10). Object-based lessons can show them that now and in their future career, they will not always be prepared for objects (interview 4). However, it is important to note that according to interviewee 4, "there are not many jobs in museums so if the educator becomes too enthusiastic it is disappointing much later for students". Similarly, zoology, biology, and geology students can gain more experience doing dissections and working with microscopes (interview 3). OBTL can also encourage medical students and young medical practitioners to reflect on the human dimension of medicine,

learning to put themselves in the shoes of others and gain situational awareness, which is crucial for the operating room (Interview 14). Medical students and young medical practitioners might also develop a stronger and better understanding of who they are and who they want to be as medical professionals (Interview 6). Similarly, interacting with objects can show future physics teachers that teaching is a creative and knowledge-transforming act with an evolving purpose, giving them insights into their future role as educators (Interview 12).

OBTL can be especially useful for students **to develop communication and collaboration** skills. For instance, OBTL can also be used as a community-building experience for medicine students and young medical practitioners (Interview 14). Objects can become frontiers to connect different social and professional worlds, making OBTL an especially interesting approach when teaching interdisciplinary groups (Interview 9). Students from various groups are encouraged to mix and work together, which has the potential to contribute to the development of interpersonal skills. On the job market, students will have to work with people they do not know and who have completely different backgrounds. Thus, interacting with objects can be used to explore the kinds of dialogues and languages one can use to connect, preparing them for their future. For language and culture as well as for communication and media studies, OBTL can teach students to manage information and how to communicate about objects to a variety of audiences (outside of academia, in and

outside of museums) (Interviews 2, 8, 11). According to interviewee 2, this is crucial for their future as "to use something tangible (…) will be one of the best ways to communicate to people who are (…) outside of university". Students might also be asked to create different forms of media presentations of objects (e.g. videos) to further develop their existing skills (Interview 8).

Objects can also be used **to make lessons more concrete** to students. In law, objects or replicas of objects related to legal cases can be used to help students think about these cases (Interview 7). Similarly, "real objects" have the potential to enhance the process of getting to know a language. Objects make what students read about in text more concrete, allowing them to make connections to real people in history. In archeology, restoration and conservation, and museum studies, touching objects can give students better insights into how the objects were used, their functions, how they were made and why (Interview 4). Gaining knowledge about these objects, their meanings, and stories makes it easier to date them and place them in a certain culture, time, and so on and helps students reflect on their authenticity (Interview 4,7). Interviewee 3 also claims that skulls and bones illustrate changes from species to species and within species, helping students understand evolutionary patterns. Through these objects, students can also see the consequences of breeding animals, encouraging students to reflect on the reality that one should not breed those species or take responsibility for doing so (interview 3). Creating instruments and experimenting with them allows prospective

physics teachers to get a first understanding of physics experiments from different times and their processes, errors, and what is needed materially and conceptually to perform such experiments (Interviews 10, 12, 13). Students also develop insights into knowledge production and physics as a cultural activity (Interviews 12, 13). Moreover, having these experiences themselves makes students more aware of changing standards and material conditions of physical experimentation and of the evolving nature of knowledge (Interviews 10, 12). This is especially important, as “it is very difficult to find suitable literature, which goes deep into [experiments] replications” (Interview 12). Moreover, most of the time, this is students’ first real research experience. It allows them to experience research in a new way. While at first they might enjoy the process, they will eventually feel frustrated, which is typical of research projects (Interviews 10, 13). For engineering students, working with objects allows them to learn to build and work with concrete things. Interviewees 1 adds, “For them to work on something that engineers have built years ago makes a special connection”. As students come from scientific backgrounds, history is a new topic for them. This gives them a fresh outlook on the topic, generating new insights, reflections, and information for educators too (Interview 1).

VI. Conclusion

The Teaching with Objects project aims at fostering object-based teaching and learning practices that have emerged after the digital and

material turns, and the Covid-19 pandemic. To learn more about these lessons, we have investigated and collected:

- Methods and tools for teaching with objects in a variety of settings including in digital and hybrid situations.
- The opportunities and challenges of teaching with objects in different fields in the digital age.

Our research has begun with a literature search, which has collected a wide array of literature on teaching with objects, with a focus on American, British, and Australian practices. Most of the examples indeed take place in fields such as archeology, museum studies, or biology while we could not find any sources on mathematics or chemistry. Similarly, practices more prominently take place in presence. Finally, there is little information on students' experiences and perspective, inclusivity, and digital accessibility. To explore OBTL practices further and to fill these gaps, we conducted several interviews with OBTL practitioners, and observations of lessons. To do this, we have leveraged our network, focusing on European examples.

Overall, like in the literature, our research highlighted the overwhelming heterogeneity of teaching with objects in regard to

- their modes of delivery (in presence, digital, and hybrid),
- the objects,
- the tools,
- the field in which they take place,

- and the steps taken during the lesson and the activities conducted.

Regardless of the wide variety of examples collected, our interviewees have shared some common ground. While our project has been interested in practices taking place in presence, in digital and hybrid settings, when it comes to the modes of delivery, literature and interviews have highlighted a vast preference for in presence practices. This is due to the fact that objects are seen as an incredibly valuable source of information, but also the student-centered dimension of OBTL, where students generate their own knowledge. Most of the time, interviewees' lessons become digital and/or hybrid when the physical becomes impossible (e.g. during the Covid-19 pandemic) and revert to in presence after these extraordinary events.

Whether in presence, digital, or hybrid, students and/or educators use a variety of low- and high-tech tools to complement lessons. Some of our interviewees also rely on digital representations of objects. However, this does not mean that the mode of delivery of their lesson is digital or hybrid as they predominantly take place in a physical setting where students predominantly interact with physical objects.

Another common ground between examples collected relates to the field in which they are taught. Lessons are more prominent in specific fields, especially history of science and museum studies. Overall, regardless of the field in which it is taught, most of the time, teaching with objects is seen as an incredibly valuable way of

complementing “traditional” lessons rather than as a stand-alone. OBTL allows students to have realizations they might not be able to have through text-based lessons or lectures. This is due to the fact that objects are seen as an incredibly valuable source of information, but also the student-centered dimension of OBTL, where students generate their own knowledge. Specifically, teaching with objects approaches are especially valuable to impart students with transferable skills such as observation, communication or critical thinking, and teach students that objects are indeed a great source of information.

Overall, interviewees agree that teaching with objects is more time-consuming than alternative educational approaches and requires a lot of preparation. Preparation to the lessons mainly relies on the selection, access, storage, and preparation of objects; researching and additional literature to give students; communication and collaboration. According to our interviewees, communication and collaboration, flexibility, and adaptability are crucial for OBTL. Most of the time, teaching with objects is not something that one does by oneself and our interviewees regularly have had to communicate and collaborate with colleagues, curators, and cultural institutions. This preparation phase is often followed by an introduction, lecture(s) expanding on the theoretical background/context, and involves a practical part that includes a visit to an exhibition/collection, a discussion; the creation of an output and a final evaluation.

As previously mentioned, in our research, we have mainly looked for literature in English, and leveraged our network when conducting interviews and observation. As a result, most of the sources collected presented practices for the US, the UK, and Australia, and interviews and observations predominantly presented examples from Europe. Thus, OBTL practices from other parts of the world still need to be further explored to gain a better grasp of the state of the art when it comes to teaching with objects. Similarly, examples collected have predominantly taken place in specific fields such as history of science and museums studies. Thus, practices from other fields such as chemistry, music and religious studies still need to be investigated.

Moreover, like in the literature, interviewees have focused on in presence practices. However, this does not suggest a lack of interest in the digital and hybrid. For instance, the last workshop organized by this project has highlighted a high interest in the digital from participants. Digital and hybrid lessons have their own potential and value, which require further research. For instance, the use of OBTL by online Universities might be an interesting venue to investigate.

Our research has also been interested in exploring ways to make lessons inclusive and digitally accessible. However, literature fails to explore these topics in depth. While we have asked interviewees about what they do to make their lessons inclusive and digitally accessible, their descriptions remain general and only address these topics at a surface level. As they are aware of the importance of these

topics, interviewees claimed they addressed difficult knowledge and took steps towards providing equal opportunities and resources for people who might otherwise be excluded or marginalized. However, they do not expand on how they do so, and the importance they give to these. Similarly, interviewees have a tendency to adapt to situations as they arise, rather than take proactive steps and consider inclusivity and digital accessibility in their preparation of their lessons. Similarly, digital accessibility seems to be overlooked by interviewees. OBTL practitioners rely on commonly used technologies or ask students to use tools they are familiar with, making their practices somewhat digitally accessible. However, they tend to take these tools for granted and do not question digital accessibility further. Much needs to be done when it comes to exploring inclusivity and digital accessibility in OBTL and how to make practices more accessible and inclusive.

Finally, in our research, we have noticed the lack of students' voices in literature. While we have taken a first step towards exploring their perspectives, our survey still remains limited. Indeed, observations focused on Dutch practices, and not all students filled out our survey. Thus, it becomes necessary to explore new ways to give students a voice to express their views and experience to improve teaching with objects lessons, even more so as the collection of feedback is a powerful tool to finetune OBTL.

Regardless of these limitations, this research has contributed to a more comprehensive overview of teaching with objects practices in Europe while presenting reflections on these examples. While there

has been a great amount of literature addressing OBTL practices, they have had a tendency to present isolated examples rather than a more complete collection of experiences. Moreover, it is important to note that this report focuses on methods, tools, and teaching with objects in different fields. However, the research has also generated highly valuable data when it comes to advice, suggestions, and reflections that go beyond these themes. In addition to methods, tools, and teaching with objects in different fields, these pieces of information will be taken into account and shared in the teaching with objects platform this project has been building. This is especially important because sharing these findings will create a wider awareness and knowledge of teaching with objects, initiate and stimulate a lively and continuing discussion of modern ways to teach and learn with objects, contribute to the valorization of academic collections and museums in research, participation, and public engagement, and strengthen international professional networks. This is especially important, as, despite their potential to awaken different ways of knowing, seeing, and engaging, stimulating curiosity, and deepening knowledge acquisition and retention, in many universities, there are limited opportunities for making staff aware of relevant, available resources for objects-based teaching and learning.[147]

[147] Thorgensten et al, 2018, pp.3-4; Cobley, 2022, p.77

List of references

Adams, K. M. (2015). Back to the future? Emergent visions for object‐based teaching in and beyond the classroom. *Museum Anthropology*, *38*(2), 88-95.

Alexis-Martin, B. (2020), Creating Object-Based Learning for the Anthropocene: A Critical Reflection, *International Journal of Management and Applied Research,* Vol. 7, No. 3, pp. 215-223.

Baldwin, S. (2018) *An object-based research study of archive pieces incorporating digital technology.* Art, Design & Communication in Higher Education, 17 (1). pp. 25-32. ISSN 1474-273X

Barlow, A. (2017). Beyond object lessons: object-based learning in the academic library. In *The Experiential Library* (pp. 27-42). Chandos Publishing.

Bunce, L. (2016). Appreciation of authenticity promotes curiosity: implications for object-based learning in museums. In *Journal of Museum Education*, 41:3, 230-239.

CAA Australasia. (2020). New Eyes on Old Objects: teaching archaeology with photogrammetry | Thoeming et al. | CAAA2020. YouTube. Retrieved April 25, 2023, from https://www.youtube.com/watch?v=27ap7Clcic0

Cain, J. (2011). Practical concerns when implementing object-based teaching in higher education. Retrieved 5 October 2022, from https://edoc.hu-berlin.de/handle/18452/9353?show=full

Causey, A. (2015). Objects possessed, drawn, touched, identified, and sold: Effective material culture exercises for the anthropology classroom. *Museum Anthropology*, *38*(2), 133-148. Retrieved 5 October 2022, from https://anthrosource.onlinelibrary.wiley.com/doi/abs/10.1111/muan.12089

Chatterjee, H. J. (2008). Staying essential: Articulating the value of object based learning. *University Museums and Collections Journal*, *1*, 1-6.

Chatterjee, H. J. (2011). Object-based learning in higher education: The pedagogical power of museums.

Chatterjee, H., & Duhs, R. (2010). Object Based Learning (OBL) in Higher Education (HE): Pedagogical Perspectives on Enhancing Student Learning through Collections.

Chatterjee, H. J., Hannan, L., & Thomson, L. (2015). An introduction to object-based learning and multisensory engagement. *Engaging the senses: Object-based learning in higher education*, 1-18.

Cobley, J. (2022). Why Objects Matter in Higher Education. *College & Research Libraries*, *83*(1), 75.

Davidson, T. (2020, December 12). *Teaching with collections during covid-19*. UCL Culture Blog Teaching with Collections during Covid19 Comments.

https://blogs.ucl.ac.uk/museums/2020/12/12/teaching-with-collections-during-covid-19/

Davies, P. et Nicholl, J. (2017). Using object-based learning to understand animal evolution. In : *Animals and Science Education*. Springer, Cham, p. 145-157.

Duhs, R. (2011). Learning from university museums and collections in higher education: University College London (UCL).Proceedings of the 9th Conference of the International Committee of ICOM for University Museums and Collections (UMAC), Berkeley, USA, 10th–13th September 2009. http://dx.doi.org/10.18452/8698

Filipowska, R., & Milkova, L. (2013). Agile Pedagogies: Cultivating Equity and Community through Remote Teaching with Art . *Integrative Teaching International: 2021 Future Forward Special Issue* , 4–8. https://static1.squarespace.com/static/596f9bd9f7e0ab990a3e18d3/t/6228c8c9571e1206f6ab8eb9/1646840015264/Agile+Pedagogies+Cultivating+Equity+and+Community+through+Remote+Teaching+with+Art+By+Roksana+Filipowska+and+Liliana+Milkova+Introduction+The+Yale+University+Art+Gallery%E2%80%99s+encyclopedic+collection%2C+exhibition+spaces%2C++%281%29.pdf

Gould, S. (2011). Sequel–An artistic collaboration between the Slade School of Fine Art and UCL Museums & Collections.

Griggs, B (2017). Make it Count: Object-based Pedagogies to Increase Civic Competence A Brief Overview of Teaching with Material Culture. *Oregon Journal of the Social Studies*, p. 16.

Hardie, K. (2015). Innovative pedagogies series: Wow: The power of objects in object-based learning and teaching. *Higher Education Academy*, 1-24.

Hatchwell , S., & Halliwell, H. (2022, February 14). *Adapting object-based learning for the virtual classroom*. University of Birmingham. https://www.birmingham.ac.uk/news/2021/adapting-object-based-learning-for-the-virtual-classroom

Hess, M., Garside, D., Nelson, T., Robson, S., & Weyrich, T. (2017, August). Object-based teaching and learning for a critical assessment of digital technologies in arts and cultural heritage. In *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (ISPRS)* (Vol. 42, pp. 349-354). International Society of Photogrammetry and Remote Sensing (ISPRS).

Hess, M., Schlieder, C., Troi, A., Huth, O., Jagfelt, M., Hindmarch, J., & Henrich, A.. (2019). Digital Technologies in Heritage Conservation. Methods of Teaching and Learning This M.Sc. Degree, Unique in Germany. In: Luigini, A. (eds) Proceedings of the 1st International and Interdisciplinary Conference on Digital Environments for Education, Arts and Heritage. EARTH 2018. Advances in Intelligent Systems and Computing, vol 919. Springer, Cham. https://doi.org/10.1007/978-3-030-12240-9_7

Irving, H. (2021), 'Teaching with Objects in Lockdown', Social History Society,

https://socialhistory.org.uk/shs_exchange/teaching-with-objects-in-lockdown/

Kador, T., Hannan, L., Nyhan, J., Terras, M., Chatterjee, H. J., & Carnall, M. (2018). Object-based learning and research-based education: case studies from UCL curricula. UCL IoE Press.

Kreps, C. (2015). University museums as laboratories for Experiential Learning and engaged practice. *Museum Anthropology*, *38*(2), 96–111. https://doi.org/10.1111/muan.12086

Krmpotich, C. (2015). Teaching collections management anthropologically. *Museum Anthropology*, *38*(2), 112-122.

Ladkin, N., Johnson, E., Baker, R. J., & Chatterjee, S. (2011). The use of collections in research and teaching at the Museum of Texas Tech University.

Lelkes, J. (2019). How inclusive is object-based learning?. *'Libraries, Archives And Special Collections' Special Issue*, *4*(1). Retrieved 5 October 2022, from https://sparkjournal.arts.ac.uk/index.php/spark/article/view/110/196.

Loic, E. (2022). Teaching Collections and Codicology in the Age of Digital Surrogates. *Peregrinations: Journal of Medieval Art and Architecture*, *8*(1), 41-51.

Marie, J. (2011). The role of object-based learning in transferable skills development.

Martindale, S. (2020, November 30). *Microteaching Reflection*. Teaching & Learning 2020. https://tl2020.myblog.arts.ac.uk/tag/obl

McCarthy, C. (2021). A lesson in object-based teaching: Colonial history, museum practice and ethics seen through a Māori portrait. *Detours: Social Science Education Research Journal*, *2*(1), 85-88.

McGrath, C.,. Palmgren, P. J. & Liljedahl M. (2019) Twelve tips for conducting qualitative research interviews, Medical Teacher, 41:9, 1002-1006, DOI: 10.1080/0142159X.2018.1497149

Medina, S., Pêgo, J. P., Machado, C., Aires, J. C., & Rebelo, J. (2011). Building a collaborative network for the digital representation of engineering collections.

Mida, I., & Kim, A. (2015). *The dress detective: A practical guide to object-based research in fashion*. Bloomsbury Publishing.

Miles, B. (2018). Unleashing the pedagogical power of object-based learning. Retrieved 6 October 2022, from https://teche.mq.edu.au/2018/05/unleashing-the-pedagogical-power-of-object-based-learning/

Milkova, L. (2018). Art engagement and the college curriculum: Factors and strategies for success in collection-based teaching. *University Museums and Collections Journal*, *10*, 67-76. Retrieved 8 September 2023 from https://www.academia.edu/35651161/Academic_Programs_Teaching_

and_Learning_with_Collections_of_the_Allen_Memorial_Art_Museum

Mouliou, M. (2018) Engaging with University Museum Collections: Paradigms of Participatory Museum Practice. *Turning Inside Out European University Heritage*, 127.

Noble, G. (2011). Heritage in hospitals: Using museum objects to teach communications skills.

Nyhan, J. (2014). Object-based learning: teaching Digital Humanities. Retrieved 11 October 2022, from https://archelogos.hypotheses.org/162

Object-Based Learning | Academic Technologies. Retrieved 5 October 2022, from https://academictechnologies.it.miami.edu/explore-technologies/technology-summaries/object-based-learning/index.html

Object-based learning (OBL) in Higher Education: Fuma. Flinders University. (n.d.). Retrieved February 3, 2023, from https://www.flinders.edu.au/museum-of-art/object-based-learning-toolkit/obl-higher-education

Paris, S. G., & Hapgood, S. E. (2002). Children learning with objects in informal learning environments. In S. G. Paris (Ed.), *Perspectives on object-centered learning in museums* (pp. 37–54). Lawrence Erlbaum Associates Publishers.

Pearce, S. M. (1994). *Interpreting objects and collections*. Routledge.

Phillips, C., Sunderlin, D., & Addy, T. (2021). Adapting to New Modes of Teaching During COVID-19: Developing Instructional Approaches that Empower Learners and Facilitate Virtual Learning Experiences. *Journal of Transformative Learning*, *8*(1), 10-21.

Pollalis, C., Minor, E. J., Westendorf, L., Fahnbulleh, W., Virgilio, I., Kun, A. L., & Shaer, O. (2018, March). Evaluating learning with tangible and virtual representations of archaeological artifacts. In *Proceedings of the Twelfth International Conference on Tangible, Embedded, and Embodied Interaction* (pp. 626-637).

Prown, J. D. (1982). Mind in Matter: An Introduction to Material Culture Theory and Method. *Winterthur Portfolio*, *17*(1), 1–19. http://www.jstor.org/stable/1180761

Raynes I., & Heiser N. (2020): Cartographic literacy through object based learning: The value of primary sources in instruction, Journal of Map & Geography Libraries, DOI: 10.1080/15420353.2020.1739188

Scholten, H., & van 't Hoogt, V. (2021). Deconstructing Instructions in the Art Academy. Drawing: Research, Theory, Practice, 6(1), 123–137. https://doi.org/10.1386/drtp_00055_1

Smith, D. P. (2016). Bringing experiential learning into the lecture theatre using 3D printed objects. *F1000Research*, *5*.

Smith, D. (2019, April 9). *What is Object Based Learning?*. David's adventures in the classroom. https://davethesmith.wordpress.com/object-based-learning/

Sparks, R. T. (2011). Object handling in the archaeology classroom–Strategies for success .Retrieved 5 October 2022, from https://edoc.hu-berlin.de/handle/18452/9352

Tanabashi, S. (2021). STEAM education using sericulture ukiyo-e: Object-based learning through original artworks collected at a science university museum in Japan. Interdisciplinary Journal of Environmental and Science Education, 17(4), e2248. https://doi.org/10.21601/ijese/10962

Tegelberg, J. (2011). The Museum Collections of Craft Teacher Training. Cultural heritage serving education and research.

Teaching With Objects: Traveling Museum Project. (2014). Retrieved 5 October 2022, from https://umfa.utah.edu/sites/default/files/2017-07/teaching%20with%20objects.pdf

The Knowledgeable Object. (2018). Retrieved 6 October 2022, from https://caumac.wordpress.com/2018/11/22/the-knowledgeable-object/

Thogersen, J., Simpson, A., Hammond, G., Janiszewski, L., & Guerry, E. (2018). Creating curriculum connections: a university museum object-based learning project. *Education for Information*, *34*(2), 113-120. https://doi.org/10.3233/EFI-180190

Tomiya, S., Swartz, B. A., & Batavia, M. (2011). The educational values of the University of California Museum of Paleontology.

Turin, M. (2015). Devil in The Digital: Ambivalent Results in an Object‐Based Teaching Course. *Museum Anthropology*, *38*(2), 123-132.

Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2). (2020). *YouTube*. Retrieved October 6, 2022, from https://youtu.be/B-qUpffopvQ.

Xheraj-Subashi, D., Sfyroera A.S., Roggenbucke, M.**,** Megremi, I**.,** Magganas, A. University Museums of National and Kapodistrian University of Athens from Inside Out-Mapping Teaching Tools. *Academic Journal of Interdisciplinary Studies*, 2019, vol. 8, no 4, p. 45-45.

Walsh, d & Seale, C. (2012). Doing Ethnography. in Seale, C. *Researching society and culture*.

Woodwall, A. (2019, April 29). *Material learning, objects, and online embodiments*. Cultural Practices. Retrieved October 5, 2022, from https://www.culturalpractice.org/article/material-learning-objects-and-online-embodiments

Images references

Creative Tools. (2010). *VIUscan handheld 3D scanner in use*. File:VIUscan handheld 3D scanner in use.jpg. Wikimedia. Retrieved September 25, 2023, from https://upload.wikimedia.org/wikipedia/commons/2/26/VIUscan_handheld_3D_scanner_in_use.jpg.

Kowalewski , K. (2016). A man wearing an augmented reality headset. Wikimedia. Retrieved August 25, 2023, from https://en.wikipedia.org/wiki/Augmented_reality#/media/File:MicrosoftHoloLensBloomGesture.JPG

Lenz , L. (2019). A 3D printer printing a blue miniature object. Wikimedia. Retrieved September 25, 2019, from https://upload.wikimedia.org/wikipedia/commons/2/2f/3D_printer_at_35c3_01.jpg.

Ivan.Giogio (2015). *File:Balkan Heritage Field School-5.jpg - Wikimedia Commons*. (2015). Retrieved February 06, 2024 from https://commons.wikimedia.org/wiki/File:Balkan_Heritage_Field_School-5.jpg

Appendixes

Appendix 1. Topic Guide

Introduction to the interview

Hello/Welcome,

Thank you so much for taking the time for this interview. I am [name] and I will be the moderator today. My role as moderator will be to guide the discussion and I will be assisted by [name].

- Short description of the project and the aims, as a reminder.

We would like to interview you because,

- [Briefly explain why]

We have sent you a consent form for this interview and would like to repeat the most important elements: the recording, note-taking and storage of the interview, the way the interview will be used, and the opportunity to ask for clarifications at a later time. What comes next.

Do you have further questions with regard to this interview?

We have sent you a topic guide for this interview. We will now start with some questions and then move freely through the topic list along the themes and ideas you introduce.

Topic Guide

Police = most important question

Police = second most important question

Police = optional questions

Police = additional questions added after Leiden discussion

Themes	**Questions and sub-questions**
Introduction and general practices (Warm up so keep short around 5 minutes)	**1. Can you tell us about your experience with teaching with objects? (How long, discipline, target students)?** a. What are the different ways in which you teach with objects? **2. Why did you start teaching with objects?** 3. **What can be the increased value of teaching with objects for your discipline or syllabus?** 4. What can be the shortcomings of teaching with objects in your discipline or syllabus?
All the sections and questions below relate to the <u>example selected (in the aftermath of the pandemic)</u>	**Try to find out which are the most interesting, for the interviewee and/or the project. Why this one specifically?**
Preparation process	**1. Can you walk me through how you prepare your lesson?** 2. What obstacles and challenges did you encounter when developing your lesson? 3. When you design a lesson how do you account for students' different learning styles? 4. If you teach students from different backgrounds, how do you account for students' different backgrounds?

Goals and objectives	1. **What are the three main pieces of knowledge or skills you want to teach participants?** a. How does teaching with objects help you achieve this goal?
Carrying out of the lesson	1. **What steps do you take? and how much time do you reserve for each step?** 2. **How do students work? What do they do? Do they work individually? In groups? Why**? 3. **What challenges and obstacles did you encounter when implementing your lesson?** 4. Did you make improvements and adjustments? What kind? 5. How do participants react to objects in this lesson? What is the general take away? **6. How do you evaluate if participants have understood the content of the lesson?** 7. How do you evaluate what the participants have thought about the lesson (did they like it or not)? 8. Where does the lesson take place?
Objects	1. **What objects do you use ?** 2. **Do you have direct access to the objects? If not, how do you arrange access and permission to use them?** 3. Where are the objects before and after the lesson?

	4. What is the impact on your syllabus/teaching when objects are not available?
Tools	**1. What tools/equipment/software do you use when you teach with objects?** **2. Is there a difference between the tools you used and the ones you wanted to use? How do you cope with that?** 3. What kind of interaction or learning do they facilitate? 4. Do you need to have special skills to use them? a. What kind ? b. Is learning those skills part of the teaching/learning?
Inclusivity	**1. How do you make sure your teaching with objects practices are inclusive?** a. **for students** (travels, marginalized groups-i.e. related to race, class/socio-economic background, gender identity, sexual orientation, age, language, immigration status, disabilities) **b. in relation to the sometimes difficult knowledge objects hold/context?**

Digital accessibility	1. **What are the challenges regarding digital accessibility you encounter?** 2. What do the solutions look like?
Sustainability	1. **What should be done in order to ensure sustainability for your teaching practice?** (Sustainable refers to the ability to maintain or support a process continuously over time) (use examples if question not understood)
Transfer/different didactic environment	1. **So when the pandemic started and everybody went into lockdown, how did you give your course then?** 2. Could your practices/methods/tools be applied/exported to different contexts? a. disciplines b. in situ, hybrid, online c. other courses, other universities, other countries
Reflection	1. **How do you evaluate or measure the success of your teaching with objects?** ask what is success? 2. **What do you think are the elements necessary for teaching with objects to be successful?** 3. How could others learn from what you have done?

	4. **What advice might you give others who want to try and teach with objects?** 5. How was your experience teaching with objects when you started teaching with objects? 6. What struggles did you encounter when you started teaching with objects? 7. What do you wish you knew or had when you started teaching with objects? 8. Now that you are more experienced, have you helped colleagues with their OBTL practices? How so?
Closing thoughts	1. **Does the note-taker have any additional questions they want to ask?** 2. **Is there anything you (the interviewee) want to add or ask?** 3. **Who do you think we should absolutely interview about teaching with objects next?**

Appendix 2: SWOT analysis

In presence OBTL

Strengths	Weaknesses
• Physical interaction ○ It encourages learners to use all their senses - especially touch, sight and smell, increasing their material sensibilities ○ Touch help learners through the borderline or liminal states which precede understanding (Duhs, 2011, p.184) ○ Activities that involve all five senses, enriching and deepening learning (Thorgerstern et al, 2018, p.3; Smith, 2016, p.3; Pollalis et al, 2018; Hardie, 2015; Cobley, 2022, p.78) ○ Interaction with authentic and replica material bring ideas to life in a way not possible through text, and digital	• Time ○ Supporting the distinct information needs of students working with one-of-a-kind objects cannot be accomplished during one-shot library instruction (Barlow, 2017) ○ Reduced time for lecturing and research (Barlow, 2017; Nyhan, 2014) ○ It requests meticulous planning (setting, timing, access to resources). (Nyhan, 2014; Cain, 2011; Sparks, 2011) • Location ○ Going to museums = limited to smaller groups of students as larger groups = can be overwhelming (Krmpotich, 2015) ○ Major limitations pertaining to (im)mobilities for people with

representations (Miles, 2018) ○ Students delight when they have the chance to make a physical contact with the past, and thrive when they are given the opportunity to build their competence and confidence in environments with fewer access barriers (Loic, 2022, p.51) ○ Even limited interactions with teaching collections have the power to shape students' future approaches to material culture (Loic, 2022, p.51). • Skills ○ Cultivates focused attention through slow looking (Object-Based Learning | Academic Technologies, n.d) ○ It enhances self-enquiry, self-analysis and self-response, which are in turn important for the development of study skills, capacities and competences ○ They help to develop the important skill of drawing conclusions based on an examination of evidence (University College Londong (UCL), 2022).	disabilities (especially field trips) (Alexis-Martin, 2020) ○ Practical and logistical concerns- challenges of stationary classroom designs, student-to-object ratio, security, note-taking, absences, access to objects outside of class (Cain, 2011) • Physical access to objects in archives and museums is highly controlled and tends to be limited to those already established as experts in their fields (Pollalis et al, 2018, Loic, 2022, pp.50-1). • Include small-medium scale cohorts to the session • It requires the acquisition of new skills • Museums, archives, and libraries have a responsibility to preserve. Trying to introduce OBL might cause tension to staff as collections should be available for student engagement. Instructors "need to consider the needs of the learners, but also the needs of the objects" (Chatterjee, Hannan & Thomson, 2015).

• The manipulation of physical objects also benefits mental and physical health (Pollalis et al, 2018). • The immersive nature of going on location has an affective impact on students, helping them explore their attitudes towards learning (Cobley, 2022, p.86). • It provides a direct link with a topic or 'the past' and can really enhance young people's interest in and understanding of a topic/subject (University College Londong (UCL), 2022). • It is ideal for generating group and class discussion (University College Londong (UCL), 2022). • It promotes the value of museums and encourages young people to visit museums and galleries with their families to further their learning (University College Londong (UCL), 2022). • Interaction with authentic and replica material bring ideas to life in a way not possible through text, and digital representations (Miles, 2018)	
Opportunities	Threats

• Interactions
  ○ Increased number of visitors to the Museum/Department/University
  ○ Small groups interaction can lead students to learn from each other
  ○ Opportunities to discover fantastic colleagues that one might not otherwise have encountered (Nyhan, 2014)
	• Increased collaboration between teachers and curators/librarians (Barlow, 2017)
	• Faculty are more likely to integrate objects in course when approached directly by knowledgeable staff (museum, library, etc) who can make suggestions (Barlow, 2017)
	• Students might not handle objects => default mode = visual engagement (Adams, 2015)
	• Unstructured discussion turn into rambling and affect learning process (Hardie, 2015)

Digital OBTL

Strengths	Weaknesses

• Interaction with the object
  ○ Allow one to consult objects without time restriction, unlimitedly and repeatedly, Can look at objects at their own pace from home (Barlow, 2017, Loic, 2022, p.41; *Umac Webinar Iv* --
	• Lack of physical dimension
	  ○ Absence of the physical experience of the objects in students' hands, which automatically limits the level of interaction and sensory engagement with the object (Martindale S., 2020).

Lockdown Lessons: Online Teaching and Students (Part 2), 2020). • Museums ○ Digital objects can be organized into many different collections and/or exhibits simultaneously. ○ Digitization of archival aids in the preservation of these materials while making them available to the audience (Loic, 2022, p.41; Object-Based Learning | Academic Technologies, n.d) ○ Digitization and online project add context to little documented collections(Turin, 2015) • Ability to include large-scale cohorts to the session (Martindale S., 2020). • Available at anytime and any location as long as there is computer/mobile device access > increased access to expertise in geographically dispersed locations (Medina, et al, 2011) • It enhances self-enquiry, self-analysis and self-response, which are in turn important for the development of study skills, capacities and	○ Minimal social interactions ■ Lack of feedback from students (*Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2)*, 2020; Loic, 2022, p.51). • Technical limitations ○ It requires technological support and technological equipment (good quality) ○ Interacting with online catalogs can sometimes be difficult if participants do not already know what they are looking for or have knowledge of the collection

competences.	
Opportunities	Threats

• Museum
  ○ Upgrade in the overall digitalization of the Museum/Department/University
  ○ Teaching staff can discover collections and become attracted to objects outside of their discipline (Barlow, 2017)
• Online dimension
  ○ Working online gives opportunities to do things that could not be done in academic/museum setting (e.g cook along based on old recipe book) (Woodwall , 2021)
  ○ Working online could enable sensory practices that could otherwise not happen in academic or museum contexts (Woodwall, 2021)
  ○ The digital can provide a platform to reassemble the analog (Turin, 2015)
  ○ The digital allows the exploration of new forms of collaboration and teaching that
	• It might keep visitors away from the Museum/Department/University
	• Decreased access to actual objects **(**Loic, 2022, p.51)
	• Technical limitations
	  ○ Technical issues (*Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2)*, 2020).
	  ○ Students might not be adept digital producers (Turin, 2015)
	  ○ Not all students might have internet access, computer access ,etc => age, gender, education, and income significantly impacted internet access (*Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2)*, 2020; Loic, 2022).

might be more creative, more subversive, and more equitable (Turin, 2015) • Possibility to reach people from the world over, audiences who would not traditionally go to the museum (Simpson et al, 2013) • Collaboration can lead to better digital asset management on campus (Barlow, 2017)	

Hybrid OBTL

Strengths	Weaknesses
● The digital and physical complement each other (*Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2)*, 2020) ● Similar to the physical if students interact with objects in person ● Enables layered learning (Woodwall, 2021)	● Teachers have to invest intensive work to oversee and facilitate the classroom activities while managing the chat (Woodwall, 2021) ● Reduces performative inquiry-based delivery of museum learning staff in the physical session (Woodwall, 2021) ● Similar weaknesses as the digital due to the use of technologies (technical issues).

Opportunities	Threats
• Open new opportunities in terms of fruition	• It might be tricky to keep together the online and offline sets

List of references Appendix 2

Adams, K. M. (2015). Back to the future? Emergent visions for object‐based teaching in and beyond the classroom. *Museum*

Anthropology, *38*(2), 88-95.

Alexis-Martin, B. (2020), Creating Object-Based Learning for the Anthropocene: A Critical Reflection, *International*

Journal of Management and Applied Research, Vol. 7, No. 3, pp. 215-22

Barlow, A. (2017). Beyond object lessons: object-based learning in the academic library. In *The Experiential*

Library (pp. 27-42). Chandos Publishing.

Cain, J. (2011). Practical concerns when implementing object-based teaching in higher education. Retrieved 5 October 2022, from https://edoc.hu-berlin.de/handle/18452/9353?show=full

Chatterjee, H. J., Hannan, L., & Thomson, L. (2015). An introduction to object-based learning and multisensory engagement. *Engaging the senses: Object-based learning in higher education*, 1-18.

Cobley, J. (2022). Why Objects Matter in Higher Education. *College & Research Libraries*, *83*(1), 75.

Duhs, R. (2011). Learning from university museums and collections in higher education: University College London (UCL).Proceedings of the 9th Conference of the International Committee of ICOM for University Museums and Collections (UMAC), Berkeley, USA, 10th–13th September 2009. http://dx.doi.org/10.18452/8698

Hardie, K. (2015). Innovative pedagogies series: Wow: The power of objects in object-based learning and teaching. *Higher*

Education Academy, 1-24.

Krmpotich, C. (2015). Teaching collections management anthropologically. *Museum Anthropology*, *38*(2),

112-122.

Loic, E. (2022). Teaching Collections and Codicology in the Age of Digital Surrogates. *Peregrinations: Journal of Medieval Art and Architecture*, *8*(1), 41-51.

Martindale, S. (2020, November 30). *Microteaching Reflection*. Teaching & Learning 2020. https://tl2020.myblog.arts.ac.uk/tag/obl

Medina, S., Pêgo, J. P., Machado, C., Aires, J. C., & Rebelo, J. (2011). Building a collaborative network for the digital representation of engineering collections.

Miles, B. (2018). Unleashing the pedagogical power of object-based learning. Retrieved 6 October 2022, from https://teche.mq.edu.au/2018/05/unleashing-the-pedagogical-power-of-object-based-learning/

Nyhan, J. (2014). Object-based learning: teaching Digital Humanities. Retrieved 11 October 2022, from https://archelogos.hypotheses.org/162

Object-Based Learning | Academic Technologies. Retrieved 5 October 2022, from https://academictechnologies.it.miami.edu/explore-technologies/technology-summaries/object-based-learning/index.html

Pollalis, C., Minor, E. J., Westendorf, L., Fahnbulleh, W., Virgilio, I., Kun, A. L., & Shaer, O. (2018, March). Evaluating learning with tangible and virtual representations of archaeological artifacts. In *Proceedings of the Twelfth International Conference on Tangible, Embedded, and Embodied Interaction* (pp. 626-637).

Simpson, A., Hammond, G., & McKenzie-Clark, J. (2013). Museum literacy that is virtually engaging. (N. Nyst, P. Stanbury, & C. Weber., Eds.).*Proceedings of the 12th Conference of the International Committee of ICOM for University Museums and Collections (UMAC)*, *6*, 59–66. https://doi.org/DOI: 10.18452/8742

Smith, D. P. (2016). Bringing experiential learning into the lecture theatre using 3D printed objects. *F1000Research*, *5*.

Sparks, R. T. (2011). Object handling in the archaeology classroom–Strategies for success .Retrieved 5 October 2022, from https://edoc.hu-berlin.de/handle/18452/9352

Thogersen, J., Simpson, A., Hammond, G., Janiszewski, L., & Guerry, E. (2018). Creating curriculum connections: a university museum object-based learning project. *Education for Information*, *34*(2),

113-120. https://doi.org/10.3233/EFI-180190

Turin, M. (2015). Devil in The Digital: Ambivalent Results in an Object‐Based Teaching Course. *Museum Anthropology*, *38*(2),

123-132.

Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2). (2020). *YouTube*. Retrieved October 6, 2022, from https://youtu.be/B-qUpffopvQ

University College London (UCL). (2022, April 21). *Teaching & object-based learning*. UCL CULTURE. https://www.ucl.ac.uk/culture/schools/teaching-object-based-learning#:~:text=Using%20objects%20in%20teaching%20not,also%20trigger%20innovative%20dissertation%20topics

Woodwall, A. (2019, April 29). *Material learning, objects, and online embodiments*. Cultural Practices. Retrieved October 5, 2022, from https://www.culturalpractice.org/article/material-learning-objects-and-online-embodiments

Appendix 3: Activity reflection

Activity	Strengths	Shortcomings
Show and tell/object demonstration	• One of the most common forms of teaching with objects (Sparks, 2011) • Work best short sessions format (Sparks, 2011) • Suitable for smaller class sizes (Sparks, 2011) • Teacher is in control (Sparks, 2011) • Good for delivering set amount of core knowledge (Sparks, 2011) • Work best in short session format (Sparks, 2011)	• Students look to facilitator for knowledge rather than try to explore themselves (Sparks, 2011) • Not all students are equal opportunity to participate (Sparks, 2011) • Time lag between object introduction and students examining (Sparks, 2011)
Activity workstation	• Can support longer sessions (Sparks, 2011) • Greater level of interactivity (Sparks, 2011; Smith, 2016)	• Flexible room arrangement required (Sparks, 2011) • The more participants the greater opportunity for non-participation (Sparks, 2011)

Activity	Strengths	Shortcomings
	• Discussion with peers => students less constrained in what say (Sparks, 2011) • Ice-breaker activity as learners focus on objects while developing social skills (Hardie, 2015)	• Time consuming (Sparks, 2011) • Possible distraction and socialising (Sparks, 2011) • Unstructured discussion can turn into rambling and affect learning process (Hardie, 2015) • Exploratory nature of workshops might make students feel uncomfortable at first (Davies & Nicholl, 2017)
Research	• Greatest rewards in terms of understanding (Sparks, 2011) • Give the opportunity to actively research and generate new areas of research/to conduct original research (Chatterjee, 2008; Barlow, 2017). • By conducting original research, teach students to avoid plagiarism (Barlow, 2017)	• Schedule one or more classes (requires more than just one class) (Sparks, 2011; Barlow, 2017) • Requires greater contact time and difficult to organise (Sparks, 2011)

Activity	Strengths	Shortcomings
	• Gives students experience working in a professional manner (Barlow, 2017; Ladkin et al, 2011) • Many museum objects have had very little research conducted on them to date and are in need of better documentation (Kador et al, 2018) • Conducted research can be added to relevant museum, archive and University depository and can be shared with the wider public (Kador et al, 2018; Barlow, 2017, Ladkin et al, 2011; Causey, 2015; Kreps, 2015) • Making their research work public can motivate students to do their best work. (Causey, 2015)	
Re-create objects	• Facilitate OBTL in virtual spaces (Tanabashi, 2021)	• Technical issues (*Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2*)).

Activity	Strengths	Shortcomings
(Digitally or 3D print)	• Help in preservation and available to wider audience (Object-Based Learning | Academic Technologies; Kador et al, 2018; CAA Australasia, 2020) • Allow to study objects in the round, seeing all sides, even the ones that might be hidden in museums (Object-Based Learning | Academic Technologies) • Add context to little documented collections (Turin, 2015) • Allow students to gain a deeper understanding of the potential and limits of these digital technologies in heritage conservation (Hess et al. 2019) • Allows students to understand issues involved in the digital and physical diagnosis and reproduction of an object (Hess et al. 2019).	• Students might not be adept digital producers (Turin, 2015) • It requires technological support and technological equipment (good quality)

Activity	Strengths	Shortcomings
	• Can be more inclusive for people who do not have access to museums (CAA Australasia, 2020)	
"Crafting" activities	• Gain real artisanal skills (Barlow, 2017) • Compare past and present • Explore how objects were made (Woodwall, 2021; Hatchwell and Halliwell, 2021) • Offer new insights, increased reflection and understanding of historical practices (Scholten & van 't Hoogt, 2021) • Conveys historical concepts and developments (Barlow, 2017) • Ask questions otherwise not asked (Scholten & van 't Hoogt, 2021) • Can use objects to internalize underlying concepts and transfer them into personal narratives,	• Students might be frustrated if the focus is more on the creative response rather than the object (Marie, 2011)

Activity	Strengths	Shortcomings
	styles, and themes (Teaching With Objects: Traveling Museum Project, 2014) ● Can help students to advance the artist's intention and the object's significance by pursuing exploration on the same underlying concepts (Teaching With Objects: Traveling Museum Project, 2014) ● By reproducing the techniques of an object, students can discuss how the art form was taught to new generations, and how long the tradition/style has existed (Teaching With Objects: Travelling Museum Project, 2014) ● Crafting activities can transform students' interactions with objects, leading to new experiences, responses, and learning outcomes (the knowledgeable object, 2018)	

Activity	Strengths	Shortcomings
Creating exhibition	● Engage learners in creative active learning (Mouliou, 2018) ● Many museum objects have had very little research conducted on them to date and are in need of better documentation (Kador et al, 2018) ● Students might outreach to audiences the museum traditionally not attract (Mouliou, 2018) ● Fun, interesting and exciting for students (Hardie, 2015; Kreps, 2015, Mouliou, 2018) ● Involves high levels of risk taking and experimentation otherwise not possible in curriculum (Hardie, 2015) ● Leads to greater engagement with objects than just looking at them (Kreps, 2015) ● Powerful vehicle of OBTL as students consider relationship with	● Making exhibition with community organization such as refugee resettlement agency, is difficult, there is a necessity to adjust expectations and recognize limitations as early as possible (Kreps, 2015)

Activity	Strengths	Shortcomings
	designs and position of objects as revered exhibits (Hardie, 2015) ● Way to acknowledge all feelings about the past and try to understand them (Kreps, 2015) ● Students get a greater appreciation for work involved in creation of exhibition and Learn what goes behind the scene in museum (Kreps, 2015) ● Opportunity to learn and critique museum practices (Krmpotich, 2015; Kreps, 2015)	
Mystery object	● Create discussions and encourage detective work (Hardie, 2015) ● Engaging (Philips et al, 2021) ● Using objects that the students are unfamiliar with will encourage them to use more than one sense in order to "perceive" it as fully as possible. (Causey, 2015)	● Impossible during lockdown (Woodwall, 2021) ● The 'exploratory' nature of the workshops might make the students feel uncomfortable at first (Davies & Nicholl, 2017)

Activity	Strengths	Shortcomings
	• Provocative forms and questionable functions of the object = serve in students' contemplation (Hardie, 2015)	

List of references Appendix 3

Barlow, A. (2017). Beyond object lessons: object-based learning in the academic library. In *The Experiential Library* (pp. 27-42). Chandos Publishing.

CAA Australasia. (2020). New Eyes on Old Objects: teaching archaeology with photogrammetry | Thoeming et al. | CAAA2020. YouTube. Retrieved April 25, 2023, from https://www.youtube.com/watch?v=27ap7Clcic0

Causey, A. (2015). Objects possessed, drawn, touched, identified, and sold: Effective material culture exercises for the anthropology classroom. *Museum Anthropology*, *38*(2), 133-148. Retrieved 5 October 2022, from https://anthrosource.onlinelibrary.wiley.com/doi/abs/10.1111/muan.12089

Chatterjee, H. J. (2008). Staying essential: Articulating the value of object based learning. *University Museums and Collections Journal*, *1*, 1-6.

Davies, P. et Nicholl, J. (2017). Using object-based learning to understand animal evolution. In : *Animals and Science Education*. Springer, Cham, p. 145-157.

Hardie, K. (2015). Innovative pedagogies series: Wow: The power of objects in object-based learning and teaching. *Higher Education Academy*, 1-24.

Hess, M. *et al.* (2019). Digital Technologies in Heritage Conservation. Methods of Teaching and Learning. In: Luigini, A. (eds) Proceedings of the 1st International and Interdisciplinary Conference on Digital Environments for Education, Arts and Heritage. EARTH 2018. Advances in Intelligent Systems and Computing, vol 919. Springer, Cham. https://doi.org/10.1007/978-3-030-12240-9_7

Hess, M., Garside, D., Nelson, T., Robson, S., & Weyrich, T. (2017, August). Object-based teaching and learning for a critical assessment of digital technologies in arts and cultural heritage. In *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences (ISPRS)* (Vol. 42, pp. 349-354). International Society of Photogrammetry and Remote Sensing (ISPRS).

Kador, T., Hannan, L., Nyhan, J., Terras, M., Chatterjee, H. J., & Carnall, M. (2018). Object-based learning and research-based education: case studies from UCL curricula. UCL IoE Press.

Kreps, C. (2015). University museums as laboratories for Experiential Learning and engaged practice. *Museum Anthropology*, *38*(2), 96–111. https://doi.org/10.1111/muan.12086

Ladkin, N., Johnson, E., Baker, R. J., & Chatterjee, S. (2011). The use of collections in research and teaching at the Museum of Texas Tech University.

Marie, J. (2011). The role of object-based learning in transferable skills development.

McCarthy, C. (2021). A lesson in object-based teaching: Colonial history, museum practice and ethics seen through a Māori portrait. *Detours: Social Science Education Research Journal*, *2*(1), 85-88.

Mida, I., & Kim, A. (2015). *The dress detective: A practical guide to object-based research in fashion*. Bloomsbury Publishing.

Mouliou, M. (2018) Engaging with University Museum Collections: Paradigms of Participatory Museum Practice. *Turning Inside Out European University Heritage*, 127.

Nyhan, J. (2014). Object-based learning: teaching Digital Humanities. Retrieved 11 October 2022, from https://archelogos.hypotheses.org/162

Object-Based Learning | Academic Technologies. Retrieved 5 October 2022, from https://academictechnologies.it.miami.edu/explore-technologies/technology-summaries/object-based-learning/index.html

Phillips, C., Sunderlin, D., & Addy, T. (2021). Adapting to New Modes of Teaching During COVID-19: Developing Instructional Approaches that Empower Learners and Facilitate Virtual Learning Experiences. *Journal of Transformative Learning*, *8*(1), 10-21.

Scholten, H., & van 't Hoogt, V. (2021). Deconstructing Instructions in the Art Academy. Drawing: Research, Theory, Practice, 6(1), 123–137. https://doi.org/10.1386/drtp_00055_1

Simpson, A., & Hammond, G. (2012). University collections and object-based pedagogies . In C. Weber, P. Stanbury, & N. Nyst, (Eds.) .*Proceedings of the 11th Conference of the International Committee of ICOM for University Museums and Collections (UMAC)*, *5*, 75–82. https://doi.org/DOI: 10.18452/8724

Sparks, R. T. (2011). Object handling in the archaeology classroom–Strategies for success .Retrieved 5 October 2022, from https://edoc.hu-berlin.de/handle/18452/9352

Tanabashi, S. (2021). STEAM education using sericulture ukiyo-e: Object-based learning through original artworks collected at a science university museum in Japan. Interdisciplinary Journal of Environmental and Science Education, 17(4), e2248. https://doi.org/10.21601/ijese/10962

Teaching With Objects: Traveling Museum Project. (2014). Retrieved 5 October 2022, from https://umfa.utah.edu/sites/default/files/2017-07/teaching%20with%20objects.pdf

The Knowledgeable Object. (2018). Retrieved 6 October 2022, from https://caumac.wordpress.com/2018/11/22/the-knowledgeable-object/

Turin, M. (2015). Devil in The Digital: Ambivalent Results in an Object‐Based Teaching Course. *Museum Anthropology*, *38*(2), 123-132.

Umac Webinar Iv -- Lockdown Lessons: Online Teaching and Students (Part 2). (2020). *YouTube*. Retrieved October 6, 2022, from https://youtu.be/B-qUpffopvQ

Woodwall, A. (2019, April 29). *Material learning, objects, and online embodiments*. Cultural Practices. Retrieved October 5, 2022, from https://www.culturalpractice.org/article/material-learning-objects-and-online-embodiments

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Appendix 4: How to read an object

This document was designed as a way to inspire educators and curators with questions and categories for students to reflect on.. The specific order of sections and the questions themselves can be edited and changed, new questions or sections can be added to fit one's own lesson, aims, and methods.

How to read an object: questions and ideas for OBTL practice

Function/Purpose of the object	**Answer**
What is it?	
How is it called? Does it have a specific name or a general one?	
Why was it made?	
What was it used for? (research/didactic/other)	
Does it have more than one function? Can you list them all?	

Has its use/function changed over time? If yes, please describe why and how it has changed?	
Can it be used by anyone or does the user need specific training to use it?	
Does it produce any waste?	
Is it still working?	
Do you think it would be useful in the current days? (Yes/No, please, argument your answer)	
Physical/technical characteristics	**Answer**
What does it look like?	
How big is it? (Please, report size estimation)	
What is its shape?	
What colour is it?	

What does it feel, smell, and sound like?	
Is it complete or is there any missing part? In case of missing parts, are they consumable or have they been broken/lost?	
Has it been altered, adapted, or mended?	
Is it worn? Was it restored? Was it improved or transformed?	
What's the surface like? Is it shiny or opaque? Is it reflecting or not?	
Does it have identifying numbers?	
Are there markings/signatures or other writing on it? Are there any labels?	
What's it made of?	
Where do the materials come from?	
How many kinds of materials is it made of?	

Were the best quality materials used? Did the maker use second hand material for instance?	
How was it made?	
Is it hand or machine made?	
Is it a single-piece or is it composed by different parts?	
What does it tell you about the maker's technical skills?	
Design and Decoration *It refers to decorations and embellishments having no relation with the main function/purpose of the object. It might be related to the historical context.*	**Answer**
Is it decorated? If yes, can you describe how?	
Does decoration have a function or a meaning? If yes, can you describe which?	

Can you classify it according to a specific style?	
Does the object have stylistic, religious, artistic or iconic references?	
Is the object stylistically consistent with the period it belongs to?	
Context and history	**Answer**
When was it made? Can you refer to the specific date/year or to a period? Why?	
Where was it made? Can you refer to the exact place or to an area/country? Why?	
Where was it used?	
What can the object tell us about the political context in which it was made?	

What can the object tell us about the society/culture in which it was made? What can the object tell us about the historical period in which it was made?	
How does it fit into the history of science?	
Who made it?	
How does the object reflect the manufacturer, community, nation or culture at the time it was made?	
Who used it?	
Where was it found?	
Who owned it?/ Who used it	
Has it been owned by a single owner or has it changed it over time?	

How has the object changed over time? Can you expand on the evolution of that kind of object? Has this specific object been repaired through time?	
How does it compare to similar objects from other cultures and time periods?	
Is it a common object, is it a rare or valuable one? How many similar objects are currently kept in a Museum, to the best of your knowledge?	
Is there anything you find peculiar about the story of that object?	
Did the maker want to invoke emotion, status, sexuality, or gender roles with the object?’	
How has the Museum/University acquired the object?	
Value	**Answer**

In terms of money, from a spiritual, sentimental or practical point of view for example	
How was it valued in the past?	
How is it currently valued?	
- To the person/people who made it?	
- To the person/people who used it?	
- To the people who keep it?	
Has the object value/meaning changed over time? If yes, please describe how.	
General reflections	
Does this object remind you about other similar objects?	
What does this object make you think and feel?	

How does the object expand your knowledge of the period?	