MUSEUMAR

Lesson Plans and Activities

Manual for Trainers

Contents

Introduction

Welcome to our Lesson Plans and Activities! Here, you will find the lesson plans for all Modules and some activities that our consortium has prepared for you! The lesson plans are short and concise versions of what you learned in the Modules, providing you with brief explanations and summaries of learning outcomes! Bellow the Lesson Plans you will find and Activity Guide for Module 2 Lesson 1, Icebreakers for each of the three lessons in Module 3 and a Trainer's Guide to help you become an effective teacher to your peers and colleagues. We hope this makes learning more exciting!

Modules:

1. Basics of Augmented Reality
2. AR in learning and education
3. Aspects of AR app development
4. Implementing AR projects in cultural heritage

Module Lesson Plans

Module 1	
Title	Basics of Augmented Reality
Description	In this module, the participants will learn about the basics of AR and its surrounding context. Learners will be exposed to how AR was developed and how it relates to and differs from Virtual Reality (VR). Finally, learners will gain an understanding of how and why AR is being used to educate the public in promoting cultural heritage.
Goal	To develop a sound understanding and increase their knowledge of AR and its use in the cultural heritage context.
Target Group	Museum professionals, adult educators, artists, young graduates.
Time Arrangements	45 minutes of learning time for each lesson.
Required Resources	PowerPoint Slides, Internet Connection, Laptop, Smartphone or Tablet per participant or in groups of 2-3
Assessment	AR quiz (multiple choice questions)

Lesson 1			
Title	Augmented Reality: what is it? Augmented Reality (AR) vs Virtual Reality (VR): differences in a nutshell Augmented Reality: past and future		
Description	This lesson will provide a clear definition of what Augmented Reality (AR) is, how it differs from Virtual Reality (VR), the main steps of its development and its promising future.		
Objectives	To be able to explain, distinguish and know the parameters of AR.		
Learning Outcomes	Knowledge: Learners will be able to gain an understanding of AR and its achievements.	Skills: Learners will acquire the ability to understand and distinguish AR from VR.	Attitudes: Learners will develop a positive attitude towards AR technologies.
Expected Competences	To gain essential knowledge on Augmented Reality.		
Learning Activities	1. To familiarise themselves with Augmented Reality through some examples. 2. To understand the differences between AR and VR. 3. To navigate the web and take a quick look at the main events and characters that have contributed to the developments of Augmented Reality technologies.		
Teaching Methods	Explanation, PowerPoint Presentation. There are case studies, videos, and other resources to look into while learning.		
Required Resources	Internet connection and laptop, smartphone or tablet per participant or in groups of 2-3.		
Hand-Outs and Activity Sheets	PowerPoint presentation in hard copy.		

Duration	15 minutes

Lesson 2	
Title	**How can the AR experience be brought to life?**
Description	Learners will acquire theoretical knowledge of AR aspects and the different AR types used in educational and cultural heritage settings.
Objectives	To be able to explain the differences between the various types of AR.
Learning Outcomes	Knowledge: Learners will learn about the different types of AR.	Skills: Learners will be able to conceptualise the idea of AR.	Attitudes: Learners will feel closer to AR and how it can be used in real life.
Expected Competences	Learners will be able to think about the different types of AR and explain them to others.		
Learning Activities	1. To familiarise themselves with the different types of AR. 2. To understand how these technologies function.		
Teaching Methods	Explanation, PowerPoint Presentation, discussion.		
Required Resources	Internet connection and laptop, smartphone or tablet per participant or in groups of 2-3.		
Hand-Outs and Activity Sheets	PowerPoint presentation in hard copy.		
Duration	15 minutes		

Lesson 3	
Title	**Augmenting Museums in the cultural heritage sector**
Description	Learners will be exposed to the different methods and best practices AR can be used to promote cultural heritage.
Objectives	To gain a deeper understanding of AR as an educational tool.
Learning Outcomes	Knowledge: Learners will learn about the importance of AR in the cultural heritage sector.	Skills: Learners will gain a better understanding of AR and its role.	Attitudes: Learners will acquire the attitude that AR can enhance cultural heritage.
Expected Competences	To get a deeper understanding of AR as a total game-changer in the Cultural Heritage Sector.		
Learning Activities	To navigate on the web and watch examples of AR experience.		
Teaching Methods	Explanation, PowerPoint Presentation. There are case studies, videos, and other resources to look into while learning.		
Required Resources	Laptop, Projector, Internet connection, smartphone or tablet per participant or in groups of 2-3.		
Hand-Outs and Activity Sheets	PowerPoint presentation in hard copy.		
Duration	15 minutes		

Module 2	
Title	AR in learning and education
Description	How AR is used to facilitate innovative learning and is helping shape education. Best practices of AR in education will be discussed so learners can learn through case studies of innovative practices. Participants will also learn about the strengths and constraints of AR in the educational context and what to be aware of when designing their own AR projects.
Goal	To gain the ability of thinking critically when it comes to AR in education and cultural heritage, when it is needed and when it is not, or what to be mindful of when they are embarking on their own journey with AR.
Target Group	Museum professionals, adult educators, artists, young graduates.
Time Arrangements	45 minutes of learning time for each lesson.
Required Resources	PowerPoint Slides
Assessment	No formal Assessment

Lesson 1			
Title	**Best Practices of AR in education**		
Description	Learners will be exposed to some of the best and most innovative practices of AR in the educational context.		
Objectives	To be exposed to different practices and see how the types of AR are adapted in real time.		
Learning Outcomes	Knowledge: Learners will be able to gain knowledge on some of the best practices currently in education using AR: These are: Dinosaur 4D+, Google Expedition and The Uffizi Art Gallery AR app.	Skills: Learners will acquire the ability to understand the best aspects of AR practices and learn ow to conceptualise their own.	Attitudes: By increasing their understanding of AR, learners will acquire the attitude that AR is an educational tool that can advance the learning experience.
Expected Competences	Professional Growth→ Learners will sharpen their existing skills, by learning something new and investing in their professional selves. Increased Competence on AR→ Learners will gather the appropriate set of information needed to understand the role of AR technology in education. Critical Thinking → Learners will be able to analyse and identify best practices of AR in education and potentially scale them to the needs of your organisation. Leadership→ Learner's colleagues, students and others in their professional life will look to them to provide explanations and share		

	knowledge on AR as an educational resource
Learning Activities	One learning activity at the end of the lesson, asking learners to conceptualise their own AR app.
Teaching Methods	PowerPoint Presentation. There are case studies, videos, and other resources to look into while learning.
Required Resources	• A stable internet connection and a device you can view the lesson. • A notebook, a pen or marker to take notes. • A pdf file to complete your assignment.
Hand-Outs and Activity Sheets	One hand out containing instructions on the learning activity.
Duration	45 minutes

Lesson 2	
Title	**AR strengths and limitations in education**
Description	Learners will be able to understand the strengths and limitations of AR when using it for educational purposes.
Objectives	To develop the ability to identify what AR aspects should be incorporated into their projects.

Learning Outcomes	Knowledge: Learners will learn about the positives and negatives of AR in education and where it is suitable for use.	Skills: Leaners will be able to develop a variety of skills to make them adept in AR as an educational tool.	Attitudes: Learners will be able to develop the right attitudes in how to use AR in education, while understanding the nuances of when it is the right tool to use and why.

Expected Competences	**Problem Solving**→ Learning about the advantages and limitations of AR will enable you to solve problems that arise when you are trying to implement a project of your own. **Confidence**→ Learners will feel more confident in yourself, since you they be able to explain the concepts presented in this lesson in a clear way. **Cognitive Strategy**→ Learners will be able to think about AR in education more effectively, organise the material and your thoughts. **Collaboration**→ In explaining these concepts to others, you will help them understand what you have, which will promote effective collaboration between you and your colleagues.
Learning Activities	Comprehension exercise on the case study featured.
Teaching Methods	Power Point Prese, Best practices

Required Resources	• A stable internet connection and a device you can view the lesson. • A notebook, a pen or marker to take notes.
Hand-Outs and Activity Sheets	No hand out for this lesson.
Duration	45 minutes

Module 3

Title	Aspects of AR app development
Description	In this module, learners will be exposed to the different technologies that support the development of AR apps, particularly the hardware and software needed to create educational content through AR. Learners will see how AR apps make objects appear natural in physical space and the tools used (glasses, headsets) to add interactive elements to the experience.
Goal	To develop the essential theoretical and technical knowledge and skills related to AR app development and understand how each aspect must be carried out.
Target Group	Museum professionals, adult educators, artists, young graduates.
Time Arrangements	45 minutes
Required Resources	Internet, Smartphone or Tablet per participant or in groups of 2-3
Assessment	1. To create their own software exercise through the open-source application 2. To experiment through the selected AR applications 3. To understand the deliverables of the presentation and evaluate through the questionnaire

Lesson 1

Title	Hardware for AR app development		
Description	This lesson will provide a theoretical background on the hardware used to develop AR apps.		
Objectives	To gain essential knowledge on the hardware used to develop AR apps and identify the right one for their project.		
Learning Outcomes	Knowledge	Skills	Attitudes
Expected Competences	To explain the concept of AR hardware and its usage to the real life educator		
Learning Activities	1. To be able to understand the similarities between the 3 different types of AR Hardware		

	2. To be able to understand the differences between the 3 different types of AR Hardware 3. To be capable to state 3 pros and cons of the different types of AR Hardware
Teaching Methods	Non-formal, adaptive,
Required Resources	Laptop, Projector, Internet connection, smartphone or tablet per participant or in groups of 2-3
Hand-Outs and Activity Sheets	PowerPoint presentation in hard copy
Duration	15 minutes

Lesson 2	
Title	**Software for AR app development**
Description	This lesson will provide a theoretical background on the software used to develop AR apps.
Objectives	To gain essential knowledge on the available software used to develop AR apps.
Learning Outcomes	Knowledge	Skills	Attitudes

Expected Competences	To explain the concept of AR software and its usage to the real life educator
Learning Activities	1. To be able to understand the different types of AR software 2. To experiment and practise with the provided open-source software 3. To adopt a positive attitude towards the AR softwares
Teaching Methods	Non-formal, adaptive,
Required Resources	Laptop, Projector, Internet connection, smartphone or tablet per participant or in groups of 2-3
Hand-Outs and Activity Sheets	Powerpoint presentation in hard copy
Duration	15 minutes

Lesson 3	
Title	**Tools to enhance the AR experience**
Description	Learners will be able to learn about all the tools used for enhancing AR experiences, such as glasses, AR headsets etc.
Objectives	To learn about the available tools for enhancing the AR experience and be able to identify the right one for their project.
Learning Outcomes	Knowledge	Skills	Attitudes

Expected Competences	To explain the concept of AR tools and their usage in the real life educator
Learning Activities	1. To be able to understand the different types of tools to experience the AR 2. To be able to choose the proper tool according to their needs 3. To understand the differences between the different types of AR tools 4. To navigate and experiment through the provided open source AR application
Teaching Methods	15 minutes

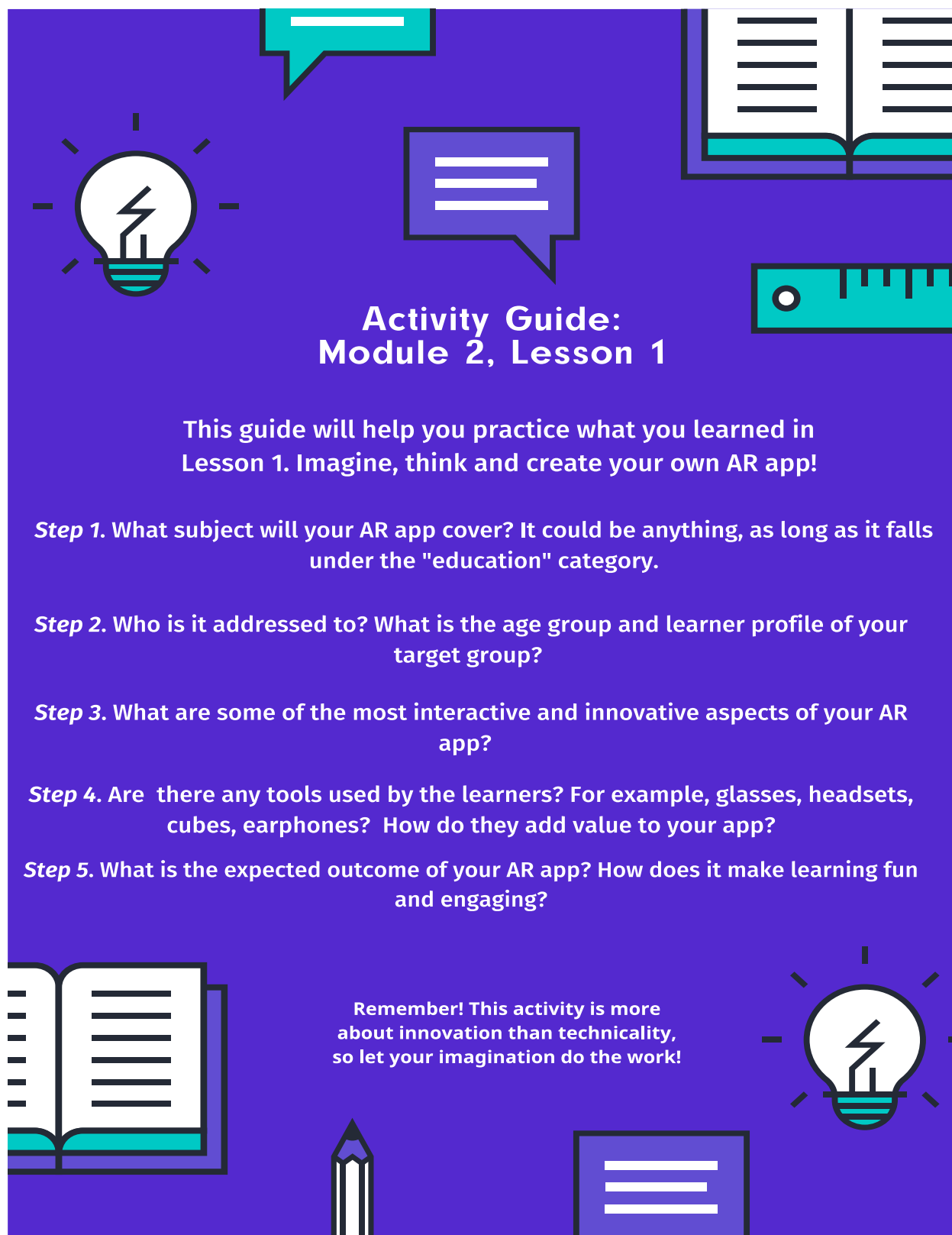| Required Resources	Non formal, adaptive,
Hand-Outs and Activity Sheets	Laptop, Projector, Internet connection, smartphone or tablet per participant or in groups of 2-3
Duration	Powerpoint presentation in hard copy

Module 4	
Title	Implementing AR projects in cultural heritage
Description	Learners will engage with the different parameters of developing an AR app. The target group will learn about all the stages of AR app development, from conceptualisation, finding funding, engaging with outside stakeholders, marketing and advertising. Focus will be given to developing soft skills such as good communication, outreach and teamwork, professional writing etc.
Goal	To develop skills beyond the technical aspect, learn to collaborate for good results, set goals and strategy, and visualise the success.
Target Group	Museum professionals, adult educators, artists, young graduates.
Time Arrangements	Approximately 45 minutes for each lesson of the Module
Required Resources	Different AR tools for testing, Laptops, Whiteboard, Internet/Wlan, physical space for testing the AR tools.
Assessment	Quiz, observation, self- and peer evaluation

Lesson 1			
Title	**Conceptualisation, Finding Funding and Implementation**		
Description	This lesson will provide and discuss all the essential skills to conceptualise, develop and run an educational program based on AR.		
Objectives	To come up with a Concept and do Market research on available tools (Google Play, Apple Store) To research funding sources (government, grants, venture capital etc) To hire developers To establish a timeframe for the development of the app(depends on AR app complexity) To make sure that the app is error-free and performs smoothly on various devices To identify marketing channels (social media, ad campaigns, and press)		
Learning Outcomes	Knowledge: overview of technical devices-latest technology, decision making about the technical support, identify existing/potential	Skills: research and summarising, presentation and communication,	Attitudes: engagement,, open-mildness to new technical tools, friendly

	partners and donors, various presentations for different stakeholders, training methods, museum staff and visitors, understanding the AR project development process, awareness about the different level of knowledge of all involved partners who may have different levels of knowledge, experiences and needs.	networking, thinking out of the box, ability to multitask	attitude, stress resistance, patience
Expected Competences	the capacity for analysis and synthesis, learning and problem solving, adapting to new situations, organising and planning, communication and negotiation		
Learning Activities	1. Work as individual and in a team 3. Do various types of presentations 4. Test various devices 5. Discussions and decision making 6. Create different story lines for the content		
Teaching Methods	Brainstorming, mind mapping, jigsaw, focus group discussion, storyboarding		
Required Resources	Different AR tools for testing, mobile devices, Whiteboard, Wlan, physical spaces for testing		
Hand-Outs and Activity Sheets	Summary of activities, Results of testing, Structured Criteria List with different aspects like weight, field of view, battery performance, computing power etc, Impulse for story development		
Duration	45 minutes for each point		

Lesson 2

Title	**Essential soft skills for educational programs**		
Description	This lesson will provide all the essential skills to run educational programs, such as collaboration, teamwork and adaptability.		
Objectives	Identify and summarise the skills needed for the staff Train soft skills of the staff		
Learning Outcomes	Knowledge to handle technical devices, solve small technical problems, how to report or address the bigger technical issues	Skills leadership, motivating the team, flexibility, adaptability, communication, creative problem solving, time management	Attitudes Patience, enthusiasm for modern technology, positive work attitude,
Expected Competences	Enhanced ability to remember learning material, faster acquisition of information and skills, increased student motivation		
Learning Activities	1. Hands-on learning 2.Teamwork 3. Apply theory in practice		

	4. Supplement current pedagogical materials
Teaching Methods	Explanation, demonstration , interaction
Required Resources	mobile devices, internet/Wlan, AR apps, headsets
Hand-Outs and Activity Sheets	Guidelines and instructions on how to use the app, worksheets to be combined with devices/apps
Duration	45 minutes

Activities

Activity Guide:
Module 2, Lesson 1

This guide will help you practice what you learned in Lesson 1. Imagine, think and create your own AR app!

Step 1. What subject will your AR app cover? It could be anything, as long as it falls under the "education" category.

Step 2. Who is it addressed to? What is the age group and learner profile of your target group?

Step 3. What are some of the most interactive and innovative aspects of your AR app?

Step 4. Are there any tools used by the learners? For example, glasses, headsets, cubes, earphones? How do they add value to your app?

Step 5. What is the expected outcome of your AR app? How does it make learning fun and engaging?

Remember! This activity is more about innovation than technicality, so let your imagination do the work!

Activity Sheet

Title	**Hardware for AR app development**
Description	**One Word Game (10mins)**
Objectives	The *One Word* ice breaker is designed to allow the speaker/lecturer/trainer to provide initial context into a meeting's topic, and get everyone in the right mindset for discussion.

Learning Outcomes	Knowledge	Skills	Attitudes
Expected Competences			

Learning Activities	Using this ice breaker, encourages everyone to think about a certain topic in smaller groups ahead of time, which could increase participation during the meeting.
Teaching Methods	Allow the participants a few minutes to introduce themselves. If the group is bigger than 12 people, divide the participants into smaller groups. Ask the participants to think for a minute or two, and then share with their group one word that describes AR. Once they've shared with their groups, you can invite them to share their word with the entire room.
Required Resources	Possibility of physical, online and hybrid version based on the chosen online platform.
Hand-Outs and Activity Sheets	n/a
Duration	10mins

Lesson 2- Icebreaker

Title	**"Would You Rather"**
Description	Before starting the module, have everyone sit around in a circle or ask them to join the call with enabled camera settings. The moderator should start the going around the table and asking each person a "Would You Rather" question. A few "Would You Rather" questions to consider within the participants in the group: ● Would you rather only have summer or winter for the rest of your life? ● Would you rather go on a hike or see a movie? ● Would you rather never use social media sites and apps again, or never watch another movie or TV show?

	● Would you rather have a horrible short-term memory or a horrible long-term memory?		
Objectives	1. Introduce participants to one another and to facilitators 2. Begin engaging participants in workshop activities and encouraging them to meet new people in the room		
Learning Outcomes	Knowledge	Skills	Attitudes
Expected Competences			
Learning Activities	1.Before starting the module, have everyone sit around in a circle or ask them to join the call with enabled camera settings. 2.The moderator should start going around the table and asking each person a "Would You Rather" question. 3. A few "Would You Rather" questions to consider within the participants in the group: ● Would you rather only have summer or winter for the rest of your life? ● Would you rather go on a hike or see a movie? ● Would you rather never use social media sites and apps again, or never watch another movie or TV show? ● Would you rather have a horrible short-term memory or a horrible long-term memory?		
Teaching Methods	Take time to think and choose between two answers. The choice should be made once the impact on the person and the other participants is considered.		
Required Resources	Possibility of physical, online and hybrid versions based on the chosen online platform.		
Hand-Outs and Activity Sheets	Participants should have pen and paper to write answers for themselves		
Duration	15mins		
Lesson 3 - Icebreaker			
Title	**"Two truths and a lie"**		
Description	Two Truths and a Lie, and is a way to begin to get to know each other and get warmed up! To begin, everyone will take a couple of minutes to write down three sentences about themselves. Two of these sentences must be a truth and one sentence must be a lie. After we have finished writing, we will each take turns reading our sentences, and will try to guess each other's lie.		

	The goal of this game is to: (1) convince others that your lie is true (and that one of your truths is a lie); (2) to correctly guess other people's lies; and (3) get started with a few laughs!
Objectives	• Introduce participants to one another and to facilitators • Begin engaging participants in workshop activities
Learning Outcomes	Knowledge	Skills	Attitudes
Expected Competences			
Learning Activities	1. The moderator starts the process by telling two truths and a lie (preferably something that could plausibly be true) about themselves. Allow the group to guess the lie. 2.Allow about a minute for every participant to think of two truths and a lie about themselves. 3. Now, allow the participants a moment to learn each other's name 4. Each of the participants will share their two truths and a lie and the rest will attempt to guess which sentence is the lie. Please first say your name and affiliation, and then read your three sentences aloud in no particular order. 5.Ask each of the other participants to declare which statement they believe is a lie. 6. Once all participants have contributed, have the sharing participant reveal which statement was the lie. 7.Allow the participants to briefly exchange questions or explanations for their statements.
Teaching Methods	"Reading someone new"
Required Resources	Possibility of physical, online and hybrid versions based on the chosen online platform
Hand-Outs and Activity Sheets	Participants should have pen and paper to write answers for themselves
Duration	5-10 for each group

Purpose of the Trainer's Guide

This guide is aimed at supplementing the knowledge you gained from the modules created by the **MuseumAR** consortium. In the modules, you learned about the basics of AR, how AR is used in education, the technical aspects of it, as well as the different ways it can be used in the cultural heritage and museum sector. In this guide, you will find material that will aid you in defining your role as a trainer, showcasing essential skills, additional readings and materials. Specifically, you will find:

- Essentials skills for trainers;
- Ways of enhancing your delivery methods;
- Reading material to deepen your understanding of AR and its use in the cultural heritage sector;

Essential Skills for Trainers

1. Advanced communication skills

One of the essential trainer qualities and skills you need to have as an effective trainer is **communication**. In fact, when you are training others, it can easily make or break their experience if you are not directly communicating. A trainer should be good in explaining concepts, paying attention to their learners' concerns and address the barriers to learning.

In order to be an inspiring and engaging trainer, it is important to be **good at listening, questioning, explaining, and giving feedback**, learning how to communicate everything.

2. Advanced organisational skills

Strong organisational can get your far in your responsibility as a trainer. **Skills such as time management, are essential in planning and delivering lessons.** In learning, training, and development, **trainers need to complete various tasks before they deploy a training program**. From collecting all the materials required to delivering training efficiently, mastering organisation is vital.

A critical skill for trainers is **problem-solving, since the more organised you are, you can solve problems that appear actively.** This will lead to an excellent learning experience since you will have planned everything beforehand.

3. Adaptability skills

While delivering learning material, things may not happen the way we expect. Delays, troubles with internet connectivity, lost material can happen. **As a trainer, it is beneficial if you are prepared for such emergencies, by being adaptable.** Having a plan B for your lessons is essential.

4. Enthusiasm for lifelong learning

As a trainer, you should always strive to further your knowledge on your discipline. **Developing lifelong learning habits** so that you can keep up with all the advancements in AR in the museum industry is key. As a trainer, investing in lifelong learning makes you **able to empathise with your learners and understand the learning process from their perspective.** If you keep learning, you will never forget what it's like to be a learner

5. Advanced research skills

Innovative thinking is part of being a trainer. Instead of following old ways of teaching, trainers should be able to experiment with interactive and fun content in their lessons. This can help the learning process to become more interactive and enjoyable. Research skills will help you with adapting your material, make it more contemporary and understand the needs of your target group. As such, seeking new ways of doing so is beneficial for expanding your knowledge, as well as delivering quality lessons.

Enhancing your delivery methods

1. Mentimeter

Mentimeter gives every student a voice by investing in the participation of all students, not just the ones with the loudest voices. Mentimeter allows you to test your students' knowledge, gather feedback and ask them to reflect with our live polling features immediately. As a trainer, you can **use word clouds**, open-ended questions and more to increase interactivity while learning.

Link: https://www.mentimeter.com/

2. Canva

Canva allows you to put your creativity in play, while creating posters, invites, handouts and more. Adding exciting graphics and visual elements to the learning process makes it more interesting and enjoyable.

Link: https://www.canva.com/

3. Kahoot!

Kahoot! is a game-based learning platform, used as educational technology in schools and other educational institutions. Its learning games, "kahoots", are user-generated multiple-choice quizzes that can be accessed via a web browser or the Kahoot app.

Link: https://kahoot.com/

4. Classtime

Classtime gives the ability to trainers to receive immediate feedback on what their students have understood from the material.

Link: https://www.classtime.com/en/

5. Poll Everywhere

Poll Everywhere allows learners to choose from a variety of activity types that lets them visualise responses in real time, like open-ended Q&As, multiple choice, and word clouds. Each activity type encourages audience participation and helps trainers to collect a different kind of feedback.

Link: https://www.polleverywhere.com/

Additional Reading Material

Below you will find a variety of videos and reading material to supplement your knowledge on AR, making you a more effective trainer.

1. **Augmented Reality in Educational Inclusion. A Systematic Review on the Last Decade.**

Link: https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01835/full

2. **Augmented Reality as a Resource for Improving Learning in the Physical Education Classroom**

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7277744/

3. **The Impact of an Augmented Reality Application on Learning Motivation of Students**

Link: https://www.hindawi.com/journals/ahci/2019/7208494/

4. **Beyond Pokémon: Augmented Reality Is a Universal Design for Learning Tool**

Link: https://journals.sagepub.com/doi/full/10.1177/2158244017737815

5. **Augmented Reality in Education | Transforming Learning Experience | Fingent**

Link: https://www.youtube.com/watch?v=iJ_gb6MuLhU

6. **How AR is Jumpstarting a New Digital Reality in the Museum Sector | Brendan Ciecko | ARIA**

Link: https://www.youtube.com/watch?v=bUTex8tQ_SE

7. **Augmented Reality in the classroom - 8 fun AR apps**

Link: https://www.youtube.com/watch?v=MArFzB6UM7o