Youth EDucation on responsible use of plastics for Cleaner Oceans and waterways

WP2

Zappar - Augmented Reality Training Resource

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1. Introduction

The Zappar - Augmented Reality Training Resource was developed as part of the Y-EDCO Erasmus + project. It includes instructions for accessing the Zappar app and provides step-by-step guidance on using AR tools to create educational materials.

The main objective is introduce young people and youth workers to the use of the Zappar application for educational purposes and to encourage them to become creators of digital educational content. The long-term goal of the **Zappar Augmented Reality Training Resource** is to transform learning into engaging experiences, stimulate creativity, and pave the way for innovation in digital education.

2. Augmented Reality

Augmented Reality is a technology that overlays digital content, such as images, sounds, and interactive elements, onto the real world, enhancing the user's perception of their environment.

While both Augmented Reality (AR) and Virtual Reality (VR) reshape how we experience the world, they do so in distinct ways:

AR adds digital elements to the user's real environment, creating a digital overlay in which virtual objects appear on top of what users see through their devices.

VR involves complete immersion in a computer-generated environment. Users wear a VR headset that replaces their physical surroundings with a simulated one.

2.1. AR Characteristics

Interaction with the real world: Seamlessly overlays digital content onto physical surroundings, creating an enriched user experience.

Immersion level: Provides partial immersion, blending virtual components with real-world elements.

Cost: Generally affordable, making it accessible for a wide range of applications.

Software: AR applications that recognize and interact with real-world objects.

Devices: Compatible with commonly used devices such as smartphones and tablets, eliminating the need for specialized equipment.

AR adds digital elements to real-world environments, However, the placement of these elements varies depending on the type of experience. The two most common types are marker-free and marker-based. Marker-based AR relies on a recognizable image or object to trigger the digital content, while marker-free AR does not require such visual anchors and instead uses spatial or location-based tracking.

marker-based	markerless
a marker/ trigger starts the AR experience	no marker or trigger
It usually requires software in the form of an app, which enables users to scan markers from their device using its camera feed.	It relies on things like GPS, or sensors, computer vision, to map out a user's environment in real time and deliver dynamic spontaneous content.

Table 1 Types of Augmented Reality

In addition to these, the latest AR technology, web-based Augmented Reality (WebAR) uses web browsers to deliver AR experiences eliminating the need for dedicated applications.

2.2. Applications of AR

Education: Interactive learning experiences, including AR-enhanced textbooks and virtual science experiments.

Healthcare: AR-assisted surgeries, medical training simulations and patient education tools.

E-Commerce: Virtual try-ons for clothing, furniture placement previews.

Industry: AR-guided assembly, maintenance instructions and design visualization.

Architecture and Design: AR allows design teams to create initial building concepts, project plans and make real-time changes.

Entertainment: Immersive AR games, live event enhancements and interactive storytelling.

Live Language Translation: Instant translation,overlay translated texts on a live video feed.

Advertising: AR provides immersive experiences that connect brands and viewers emotionally.

Environmental & Sustainability: AR training guides, pollution tracking and conservation awareness campaigns.

3. AR Educational Materials

Augmented reality (AR)-based learning content combines traditional educational materials presented in audio-video or image formats, with a digital component that integrates AR elements to enrich the training experience.

3.1 Enhancing traditional educational materials through Zappar AR

AR interactive textbooks and lessons are traditional educational materials fitted with built-in AR triggers that link to videos, quizzes, and additional information. Users can scan a QR Code and instantly access additional content, such as a video explaining the process or concept in real time. When enhancing educational materials with AR, it's crucial to carefully consider how each element impacts the overall learning experience.

Target audience – Augmented reality experiences should be designed to be intuitive, engaging, and accessible to the intended audience. These experiences must align with age and EQF levels, ensuring that conceptual complexity corresponds with the learners' digital proficiency. **Clear and visible instructions regarding the download and use of the Zappar application on mobile devices should be provided**.

Learning objectives – Clearly define the goals and align AR with them. While AR offers immersive possibilities, it's easy to overcomplicate the material with too many interactive elements. **Focus on key learning objectives and integrate AR to reinforce those rather than distract from them.**

Content and Structure – **Lessons should be structured to facilitate conversion into video format**. Each lesson may be divided into distinct sections, with each section represented by a separate video clip within the same augmented reality experience, triggered by the same activation code. Ensure inclusivity, logical sequencing, concise explanations, balanced arguments, and clear headings to aid comprehension. Incorporate visuals, real-world examples, case studies, demonstrations and AR interactive elements to maintain interest.

Accuracy – Ensure information is well-researched, up to date and sourced from reliable references. Support claims with credible statistics, research findings, and expert perspectives. **Even if lessons are presented in the form of videos, it is essential that they avoid sensationalist approaches that can distort the educational content**. In this context, the main objective must be to maintain scientific rigor in the transmission of information. Education through AR should focus on stimulating critical thinking, allowing students to form a well-founded and complete understanding of the issues discussed, without being influenced by attractive but educationally irrelevant presentations.

Language - Engage a professional tone, use precise terminology relevant to environmental practice and policy; however, avoid overly technical terms or jargon. **Keep language simple and concise to cater to various literacy levels**. If the video includes voiceover, the tone and delivery must be carefully adjusted to ensure the content remains both informative and easily understandable. Establishing a connection with users is important, while maintaining the source's authority and credibility. Short pauses between ideas facilitate information processing.

Assessment and feedback – Provide ways to check comprehension, such as AR quizzes, reflection questions, or practical applications. Include 3–5 quizzes on the second page of the poster accompanying each educational module to enable real-time formative feedback.

3.2 AR Educational materials: Structure

In educational resources designed for youth, both the format of presentation and the quality of content play a decisive role. A clear and engaging format ensures accessibility and ease of understanding, while well-structured content provides depth and value. Only when these two elements are effectively integrated can true educational impact be achieved.

Each Y-EDCO module, enhanced through the Zappar Augmented Reality application, includes one or more learning materials developed in various formats:

1. **Slide-Based Presentation: 25-30 slides.**
   - PowerPoint
   - Canva

ZapWorks does not support direct PowerPoint (.ppt or .pptx) uploads. PowerPoint slides can be converted into images (PNG, JPG) or videos (MP4) and then uploaded to ZapWorks Designer to integrate them into the AR experience.

2. **Document-Based Presentation**

- PDF – Suitable for delivering structured content that integrates text and graphics in a clear, fixed layout.
- Word Document – Flexible format that can be structured as a report, proposal, or other formal document.

ZapWorks primarily supports text as a component within its AR experiences rather than direct document uploads. However, texts can still be integrated using ZapWorks Designer by manually adding and formatting them within the platform. f content from a document needs to be displayed, **consider converting it into a video or an image**.

3. Visual and Multimedia Presentations

- **Videos** – May be created, recorded, or downloaded. External hosting platforms (e.g., YouTube) can also be used by linking content.
- **Images** – Can include tracking images, flyers, or posters to support interaction and engagement.
- **3D Animations** – Enhance visualization and provide immersive learning experiences.

Technical specifications for videos in Zappar Designer:

- Maximum file size: **200 MB**
- Recommended format: **MP4**
- Recommended resolution: **720p (1280 × 720 pixels)**

3.3 AR Educational materials: Content

The effectiveness of augmented reality in education depends largely on the quality and organization of the educational content. Educational content must be accurate, pedagogically sound, and aligned with learning objectives to ensure meaningful knowledge acquisition. Within AR environments, content should also be adaptable to interactive formats, allowing learners to engage with information in ways that reinforce understanding and retention.

Key Considerations for Developing AR Educational Content:

- **Ensure Certified and Reliable Information**
  - Use credible and verifiable sources, ensuring all facts are up-to-date.
  - Cite all references appropriately.
  - Enhance topics with supporting materials such as case studies, explanations, examples and images.
- **Emphasize Visual Design**
  - Apply the **one slide = one main idea** principle for clarity and focus.
  - Incorporate dynamic visuals or infographics to maintain learner engagement and ensure that all materials can be converted to videos.
  - Avoid overcrowded slides with excessive text; prioritize relevant visuals and readable fonts.
- **Respect Copyright and Visual Identity**
  - Use licensed or openly available resources, and always confirm copyright permissions.
  - Provide proper attribution where required.
  - Integrate project visual identity elements, such as logos and disclaimers.
- **Incorporate Interactive Features**
  - Enhance engagement by embedding interactive components, including polls, quick quizzes, or other learner-centered activities.

3.4 AR Poster - Tracking Image

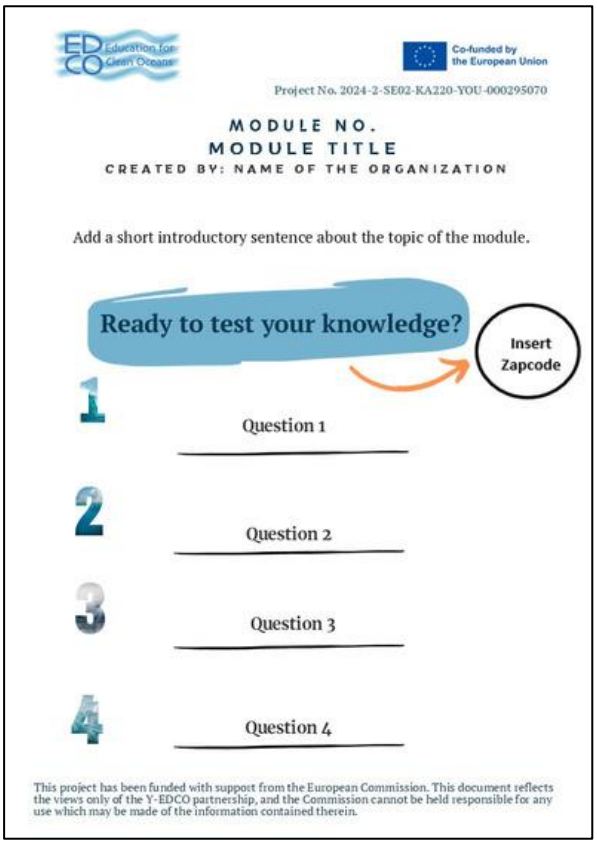
A poster or flyer represents the physical counterpart of traditional educational content adapted for Augmented Reality. In this context, the printed poster functions as a **tracking image**, anchoring the AR experience.

An effective AR-enabled poster may include the following elements:

- **Title** – Clearly presenting the module name.
- **Visual identity elements** – Logos, colors, and branding aligned with the project.
- **Disclaimer** – Relevant contractual or legal information.
- **Instructions** – Step-by-step guidance for downloading and activating the Zappar app
- **Trigger** – Direct access to specific content.
- **Assessment component** – A brief set of 3–5 true-or-false questions to assess learner understanding.

Example:

Recto



Verso

4. Zappar app. & Zapworks Designer

Zappar app and Zapworks Designer are complementary tools within the Zappar system, each fulfilling a distinct role in the creation and delivery of AR projects. The Zappar app serves as the end-user interface for viewing AR content on mobile devices, while Zapworks Designer is a web-based plarform that enables creators to build, customize, and publish AR projects without requiring advanced coding knowledge.

Distinction between the development platform (ZapWorks) and the user-facing application (Zappar app):

Distinction	Zapworks Designer	Zappar app.
Purpose	Authoring platform used to create and design AR experiences	Mobile application used to view and interact with AR experiences.
Primary Users	Developers, educators, and content creators	Learners, audiences, and end-users.
Functionality	Provides tools for building, editing, and managing AR content.	Acts as a viewer that scans tracking images, QR codes, or triggers AR content.
Access	Web-based platform (requires account and license).	Free app downloadable on iOS and Android devices.
Output/Input	Produces AR projects and experiences.	Consumes AR projects created in ZapWorks.
Level of Complexity	Medium	Low

Table 2 ZapWorks vs. Zappar App: Key Differences

4.1 Zappar app.

The Zappar app can be downloaded free of charge from the App Store or Google Play. Using the device's camera, users can scan a Zapcode to access the content. A trigger is an element that initiates the display of digital content. One of the most common used triggers is QR code or Zapcode.

Getting Started:

Download Zappar for free from your app store

Scan the zapcode then aim at the whole image

Watch it come to life

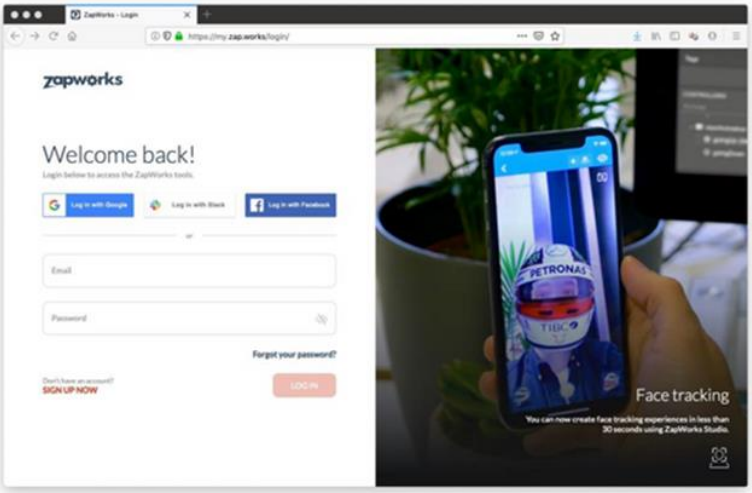
4.2 ZapWorks Designer

ZapWorks Designer is an authoring platform within ZapWorks, designed to support the creation, design, and management of interactive AR projects. The following step-by-step guidance outlines a structured approach to using ZapWorks Designer efficiently, ensuring both technical accuracy and proper project setup.

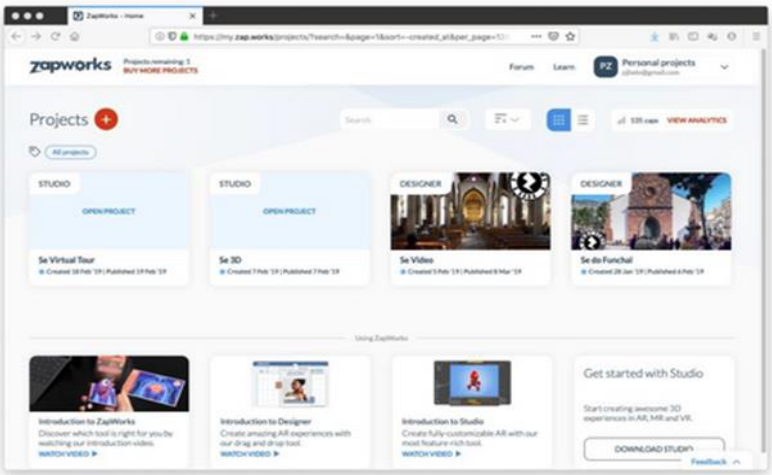
Step-by-Step Guidance in ZapWorks Designer

Step 1: Access the ZapWorks Admin Panel
Open the ZapWorks website: https://my.zap.works/login

Step 2: Create an Account
Register a new account if you do not already have one. **Each account is intended for individual user only. Sharing logins among multiple users is not allowed.**

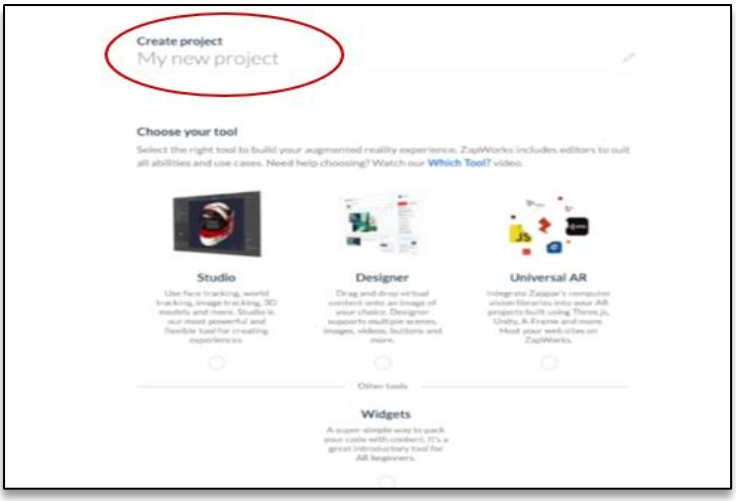


Step 3: Log In
Click the **'Login to ZapWorks'** button at the bottom of the screen. This will open the dashboard of your ZapWorks Admin account.



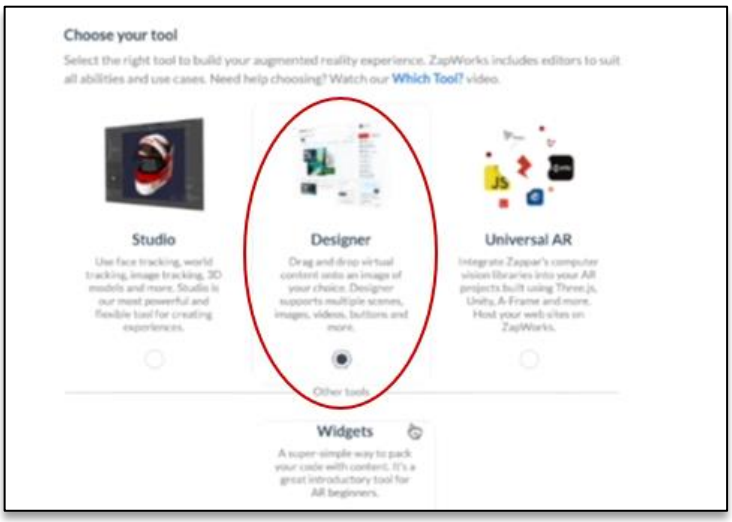
Step 4: Start a New Project
Click the **'+ New Project'** button located in the top left corner of the screen.

Step 5: Name Your Project
Enter a clear name for your project to help identify its purpose.



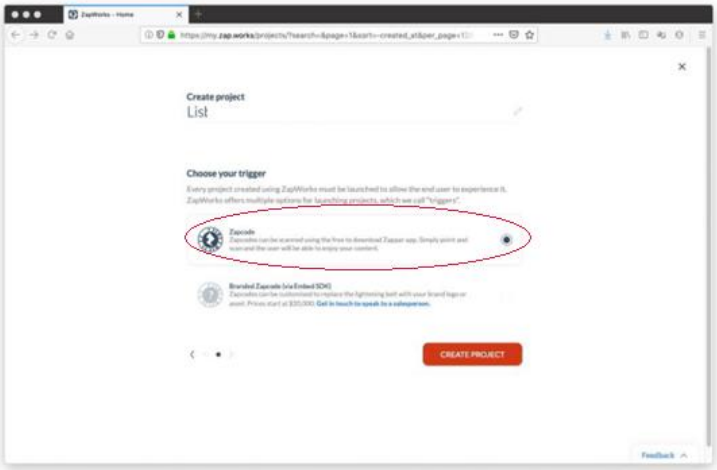
Step 6: Select the Authoring Tool
Choose the tool best suited for the project:

- Studio: Full 3D capabilities with scripting support.
- Designer: Enables visual arrangement of content within a customizable layout.
- Widgets: Positions content around a Zapcode automatically.



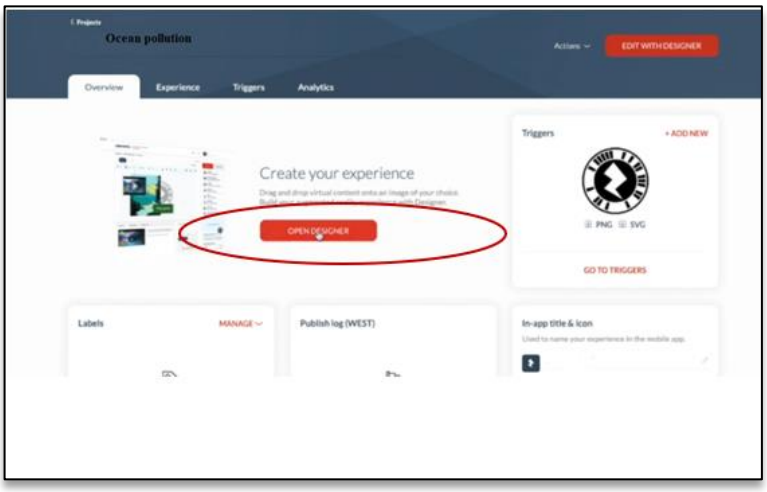
Step 7: Select the Trigger Style

Choose a **Zapcode to serve as your trigger, then** click **'Create Project'**.



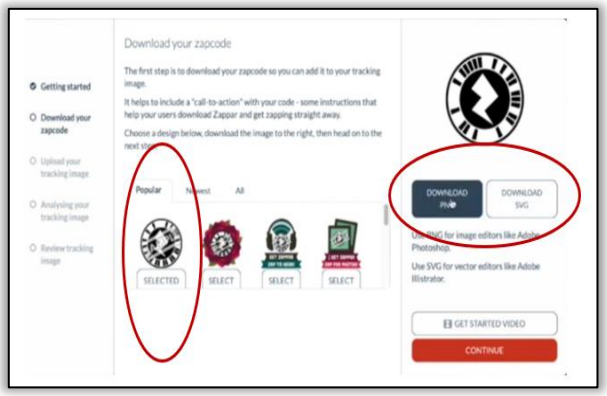
Step 8: Open Designer

Access the Designer interface to begin creating the project.



Step 9: Download the Zapcode

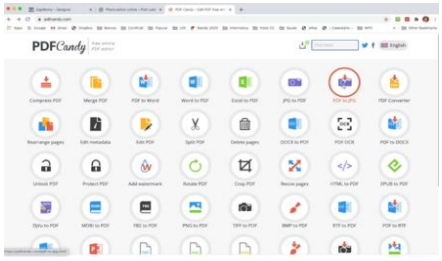
Select the design of the Zapcode, choose its extension, and save it in an organized folder for future reference.

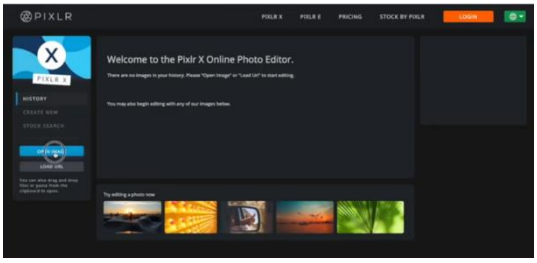


Step 10: Prepare the Tracking Image
Prepare a poster or flyer to serve as the tracking image for the educational content. For this, it must be saved as an image.

To convert PDFs into images or overlay multiple images, use tools such as Adobe Acrobat, PDF-XChange Editor, Photoshop, GIMP, or Canva.

Examples of free online software:
https://pdfcandy.com/
https://pixlr.com





Prepare Tracking Images (e. g., using PDFCandy)

PDFCandy (PDFCandy.com) is an online tool that allows users to convert PDF documents into image formats such as JPG or PNG. This functionality is particularly useful when preparing a poster to serve as AR tracking images. By converting a PDF poster into a high-quality image, each page can be individually edited and overlaid with a Zapcode, making it ready to function as an interactive AR tracking image.

Adding a Trigger to the Tracking Image

Once PDF pages have been converted into image formats (e.g., JPG or PNG), a browser-based photo editor such as **Pixlr.com** can be used to overlay the saved Zapcode. This step is essential for integrating the AR trigger directly onto the tracking image.

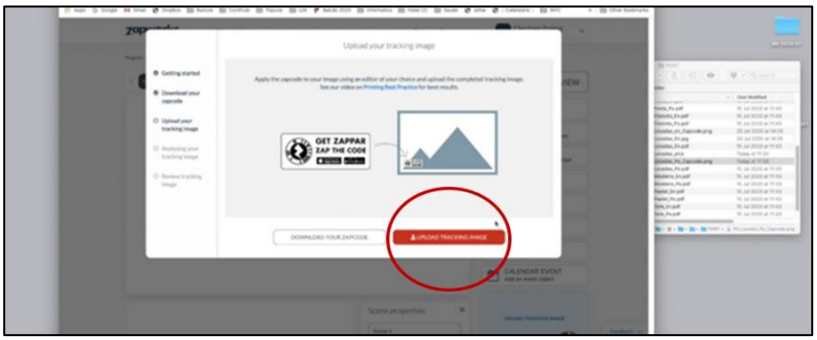
By overlaying the Zapcode onto the converted image, the resulting file becomes a complete tracking image that can be uploaded to ZapWorks Designer and used to activate the AR experience.

Positioning and Saving the Zapcode on the Poster

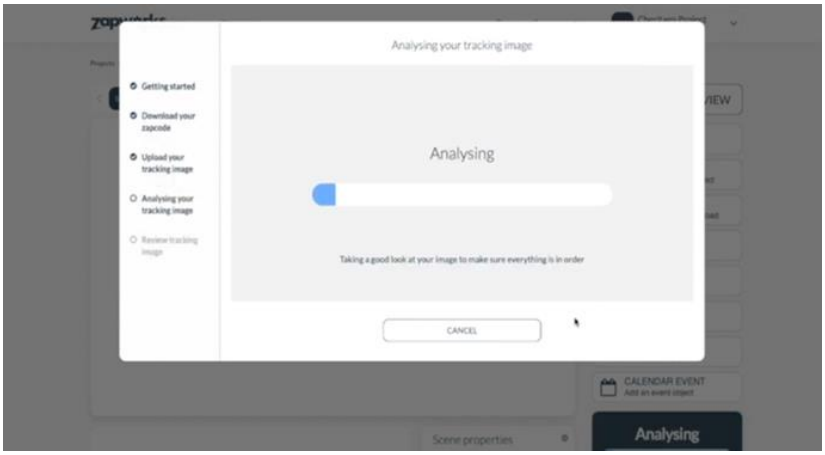
The Zapcode can be precisely resized and positioned to align seamlessly with the poster layout, ensuring optimal visibility and functionality as an AR trigger. Once properly integrated, the poster - complete with the overlaid Zapcode – should be saved in a dedicated folder for future use within ZapWorks Designer.

Step 11: Upload the Tracking Image

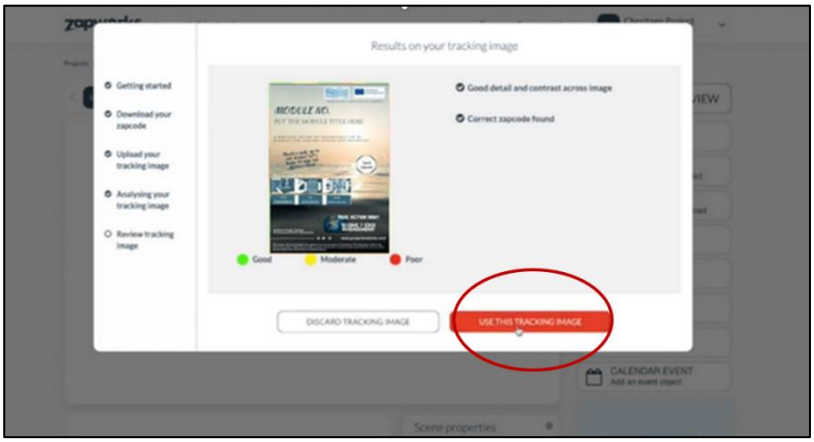
Return to the ZapWorks Designer platform and upload the finalized poster containing the embedded Zapcode.



The program automatically analyzes the uploaded poster to determine its suitability as a tracking image. This evaluation ensures that the image meets the technical requirements for reliable recognition and optimal performance in AR environments.

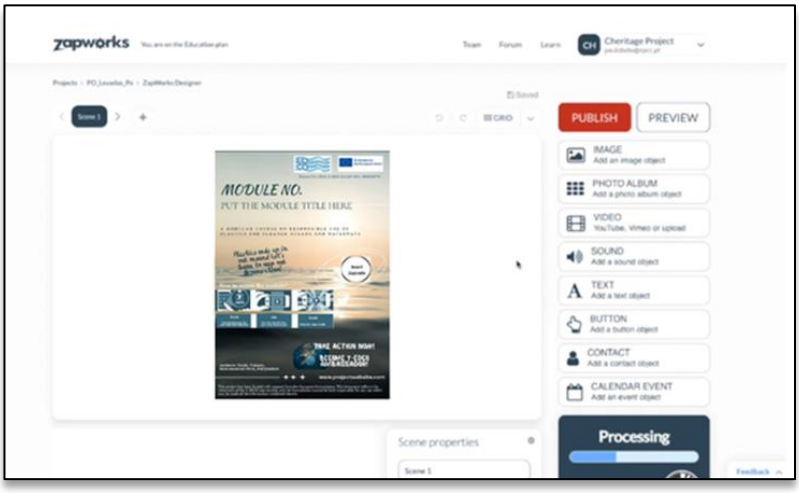


Once the analysis is complete, select **'Use this tracking image'**.



Step 12: Preview and Publish

The tracking image may be previewed and modified as needed, prior to finalization. Clicking "Publish" confirms and completes the process.

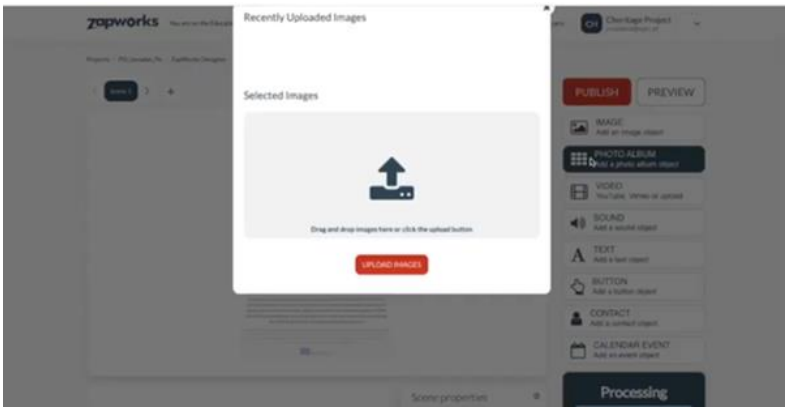


Step 13: Add Content

Once the tracking image is complete, your content can be added using the tools and options available in the right-hand panel. A variety of elements can be integrated and combined:

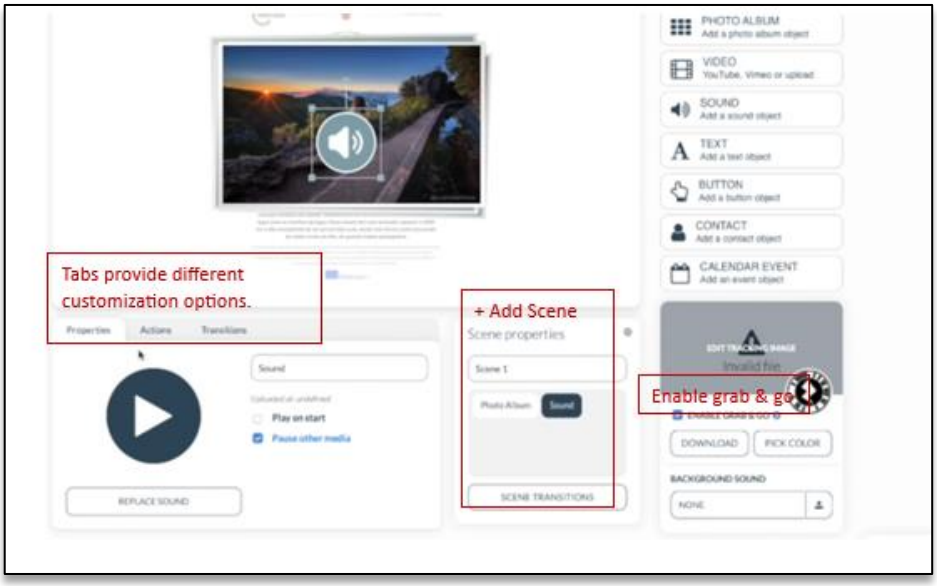
- **Image** – Insert individual images to complement or illustrate the AR experience.
- **Photo Album** – Add multiple images grouped in a gallery format.
- **Video** – Embed videos with educational materials.
- **Sound** – Include audio files to enhance the sensory experience.
- **Text** – Add informative or instructional text.
- **Button** – Create interactive buttons to trigger actions or navigation.
- **Contact Info** – Display relevant contact details for user interaction.
- **Calendar Event** – Integrate events that users can add directly to their calendars.

To upload educational materials, select the upload option and navigate to the location of the created content on your computer.



Step 14: Add effects

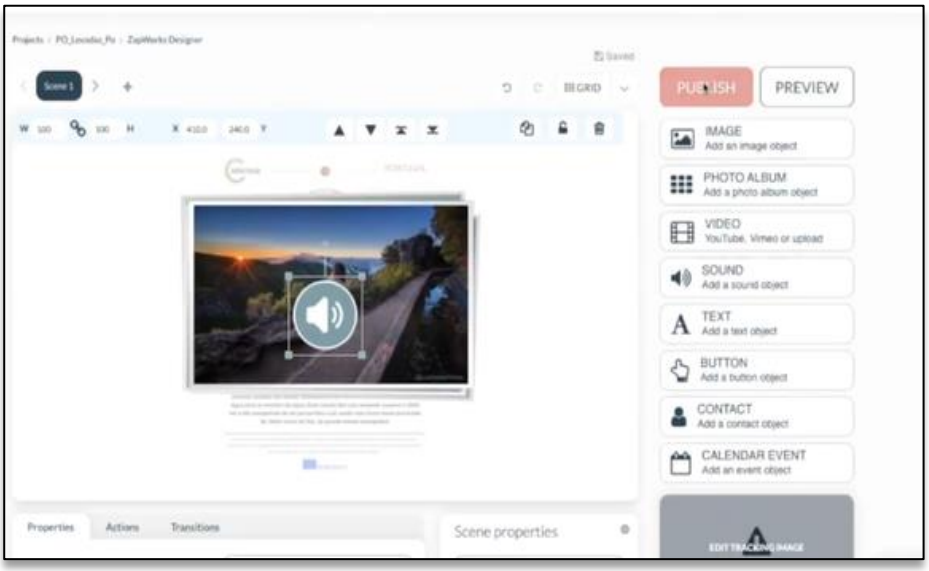
Actions, features, or colors can be edited using the tabs located beneath the tracking image.



In ZapWorks Designer, multiple scenes can be created to organize and structure AR experiences. To do this, open the Scene panel in the Designer interface, located on the left side, and click the + Add Scene button to create a new blank scene. You can then add images or videos and set transitions between scenes.

Step 15: Publish the Project

Once all content is added, preview and publish the project. The AR experience will then be accessible to anyone who scan the Zapcode attached to the poster.



4.3 Technical requirements

To ensure optimal performance, users must meet specific technical requirements related to browser compatibility, media formats, file size limits, and device capabilities.

Category	Requirement
Browser Compatibility	Chrome (v105+), Edge (v105+), Safari (v15+), Firefox (v121+) are recommended.
Image Formats	Allows PNG & JPG images; each image must be under 10 MB. Resolution: While there isn't a strict resolution limit, using appropriately sized images helps with loading speed and performance.
Video Support	Supports formats like MP4, MOV, AVIs etc.; videos must be under 200 MB. MP4 is generally the best choice for compatibility and performance. Recommended resolution: 720p (1280 x 720 pixels) is advised for a good balance between quality and file size. There isn't a specific running time limit mentioned for Zappar Designer.
3D Model Support	Formats like GLB / glTF are supported, , with a file size under 20 MB and a recommended polygon count below 100,000.
Device Compatibility	Any device with a compatible modern browser works; end-user devices (mobile especially) need sufficient performance (camera, memory etc.).
File Size Constraints	Videos < 200 MB; images < 10 MB; large assets should be optimized (smaller dimensions / compressed where possible) to avoid long load times and performance issues.
Network / Bandwidth	Internet connection quality.

Table 3 ***Technical Requirements for ZapWorks Designer***

AR technology, as facilitated by the Zappar platform, presents advanced capabilities for enhancing environmental awareness and promoting active youth engagement. It enables the development of interactive experiences that are both educational and motivational, empowering younger generations to act as catalysts for change.