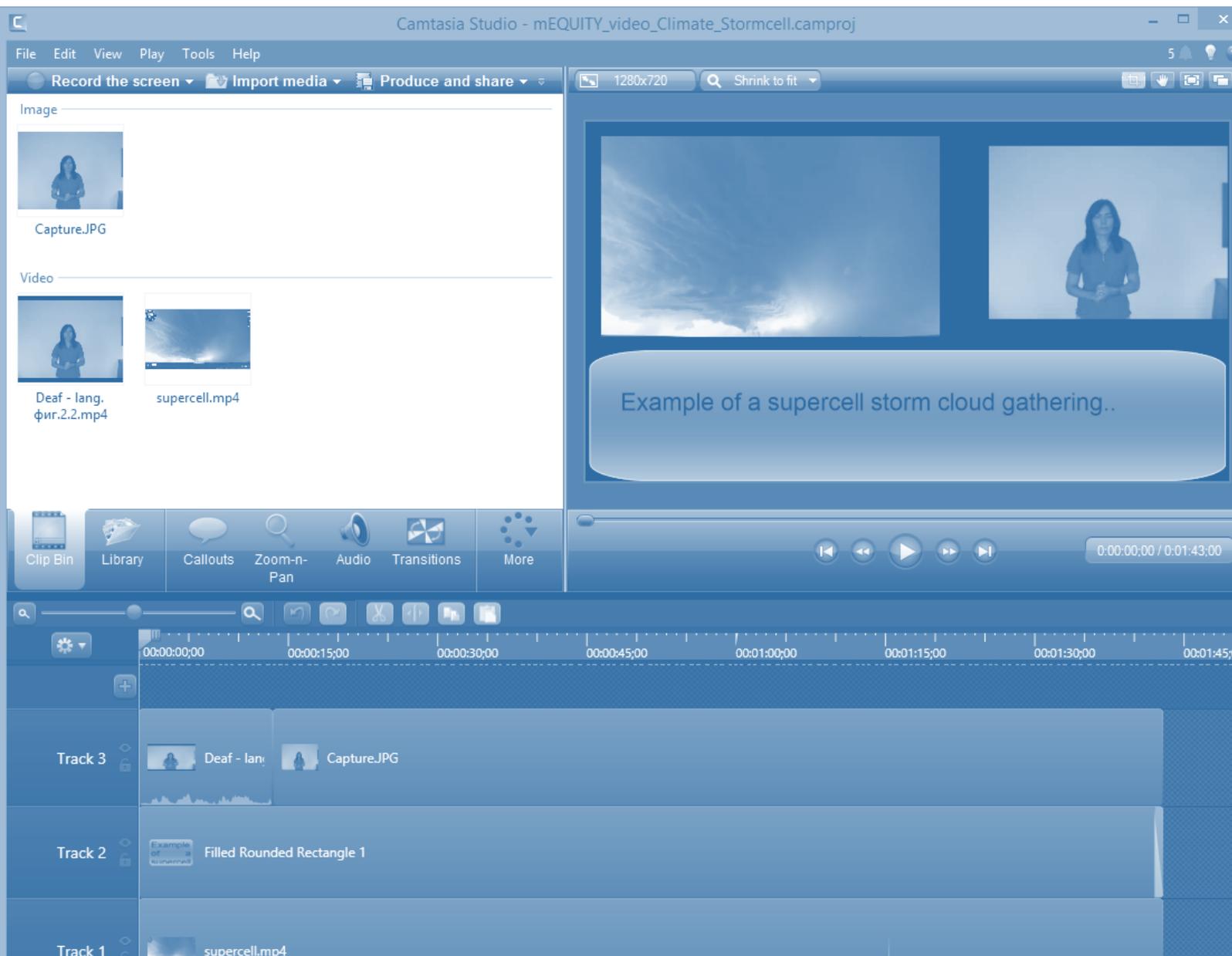# Introductory Mobile Multimedia and Augmented Reality workflow

*For European teachers working with
disadvantaged groups in education*

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1   Introduction

The mRIDGE [1] project is the European Union funded initiative that focuses on the key areas of Learning for those with a Disability or who are socially Disadvantaged through the media of Augmented Reality and Multimedia. Its aim is to create mobile applications that use augmented reality and multimedia assets adapted for educational purposes amongst disadvantaged groups. Within these groups, there is also additional focus in helping those with learning difficulties or having disabilities such as deafness, blindness or physical immobility. Development and adaptation of educational digital resources for mobile devices have been initiated within primary or secondary education institutions, with the aim of improving engagement and retention of learners.

School teachers were in need of technology enhancing approaches to learning for disabled as well as socially disadvantaged students. The mRIDGE project, an EU funded project, aimed to address engagement of students by creating multimedia content with some inclusion for Augmented Reality (AR). Distribution would be expedited through mobile devices such as smartphones and tablets. The educational institution, Ravensbourne, based in Greenwich, London, UK, was the partner that would design the multimedia the supplementary AR content.

1.1   Developing Strategies for sustaining Rapid Creativity

They key driver for training staff in multimedia creation was to ensure that they could create new media to address pressured teaching schedules, respond to last minute changes in lesson plans, yet still produce engaging content that enhances textbook referencing. This meant that content had to involve a minimal number of steps and be created in a matter of minutes. The processes and techniques were refined until a new video or AR content could be produced typically in as little as 15 minutes.

1.2   Creating Video Enhanced Learning Ecosystem

A strategy for developing content goes beyond just generating a video. An ecosystem of support needs to be created around it to ensure the video can be shared through a common portal, ideally one that is online and secure as well as private to those who need access to it. A single digital video could be shared amongst teachers by downloading from a common, online media database that could be accessed via a mobile application loaded on a smartphone or tablet. Three components usually come together to make a video that might be used for enhancing classroom engagement. Video, images and text are usually arranged in readiness for content production using an editing environment provided by video editing applications such as *Camtasia* [2]. Once produced, videos could be downloaded by teachers into smartphones and tablets for informing students. Typically, content might need to include a video of someone using sign language as guided commentary for displayed image, animation or video accompanied by some subtitle text. The three types of assets were gathered in Camtasia software and produced.

1.2   Augmented Reality Activities

The mobile App, *Aurasma* [3], was used as a quick way of generating Augmented Reality experiences from pre-existing content. New or bespoke content could be loaded, providing asset production was prepared through its online platform.

1.3 Workflow to create Multimedia Content

A program covering Multimedia and basic AR preparation, creation, production, dissemination and implementation has been created by Ravensbourne.

- **Preparation** involved gathering of assets such as images, text, animation, sound recordings, 3D models or video. Some assets needed to be edited for quality and conciseness. Audio was prepared using free sound editing software *Audacity* [4].
- **Creation** involved the layout, compilation and editing of finished assets that had been imported as a result of going through the preparation process. This was done in Camtasia software for video production and in Aurasma.
- **Production** typically was centered on exporting the finished content in alignment for a particular platform such as web, desktop, mobile or tablet.
- **Dissemination** focused on importing produced content into a specific application, platform or device. Finished videos from Camtasia were uploaded to a mRIDGE's database of assets and packaged for download to different devices. For AR media, content was uploaded as a 3D model to the Aurasma website.
- **Implementation** was about arranging events, classes or portals for end-users or audiences to experience the created content. This would either be conducted by a teacher in a class or via online learning. Pedagogical structure was applied to the implementation including appropriate assessments and evaluation.

2 Asset Preparation

Assets for production usually come in 5 varieties: Video, Audio, Text, Image as well as in AR-Ready 3D Model form.

- **Video**: Typically footage was supplied or had to be downloaded from the Internet. Files were given in MPEG (.mpg) or 3GP format but for the sake of editing, compiling or final production in Camtasia software, were converted into MPEG4 (.mp4) format. This was done by importing an .mpg file into Adobe's *Media Encoder* software, part of its Creative Cloud (CC) suite. Footage, say of a person using sign language to describe a topic video's content, was often a key component asset in making educational videos for users with hearing issues. Often accompanying such videos were videos with educational content relating to a particular subject, such as Recycling or Alternative Energy, downloaded from the Internet.
- **Audio:** Although audio asset files were not used, often audio within a video needed cleaning up for noise, quality or volume. Camtasia software imports video as a video rack and as a separate but joined audio track, in cases of poor sound, the audio track was separated and exported into a standalone file. The standalone audio file was imported into the free software *Audacity* and its filters for noise removal and volume amplification were used to provide a clearer audio track. The old track was uncoupled from the video track in Camtasia software and deleted. The cleaned up audio track was imported into Camtasia and placed on the vacated sound track, synchronized and aligned to the original video track.
- **Text:** Microsoft *Word* documents or ASCII compatible Text files to be used as subtitle content for Camtasia produced videos, had their content cut and pasted into Camtasia's 'Callout' text boxes and then positioned under a content video and accompanying signing video. The subtitle text began to be actively displayed at the time in the video where referred content was first shown. The duration of display of the subtitle text box was adjusted to fit the signing video or the relevant content in the topic video, whatever was being covered.

- **Image**: Images for use in Camtasia produced videos would arrive in a number of pixel formats, typically JPEG, PNG or BMP. The images may sometimes have to be cropped to just cover relevant content. Sometimes labels needed to be added to highlight part of the image's content. This was done in Adobe *Photoshop* software and saved back out in a JPEG format for importing into Camtasia.
- **3D Model:** Models for viewing in Augmented Reality will typically have been exported from 3D Modelling software applications such as 3DS Max [5] or Blender [6].

3 Experience Creation

This involved the layout, compilation and editing of finished assets that had been imported as a result of going through the preparation process. This was done in Camtasia software for video production and in Aurasma, for AR production.

3.1 Production of Multimedia content

Creating Multimedia content typically involved taking 3 kinds of assets - text, content video and a signing video to produce a single MPEG4 video as an output. The process involved the following key stages in using the Camtasia software.

1. Create new Camtasia Project
2. Import a Content Image or Video into the Clip Library
3. Add Content Image or Video to a track of its own.
4. Add 'Callout' text box to a track of its own for native language subtitles.
5. Add Signing Video to a track of its own.
6. Synchronise the content across tracks and align in final video space
7. Produce the video and save in MPEG4 (.mp4) format.

It is possible with prepared assets that the entire workflow above could be completed in as little as 15 minutes for a content video of small duration say a few minutes. With a template Camtasia project from a video that already been created, the whole process can be completed in 5-10 minutes. A typical Camtasia project screen shot is shown below.
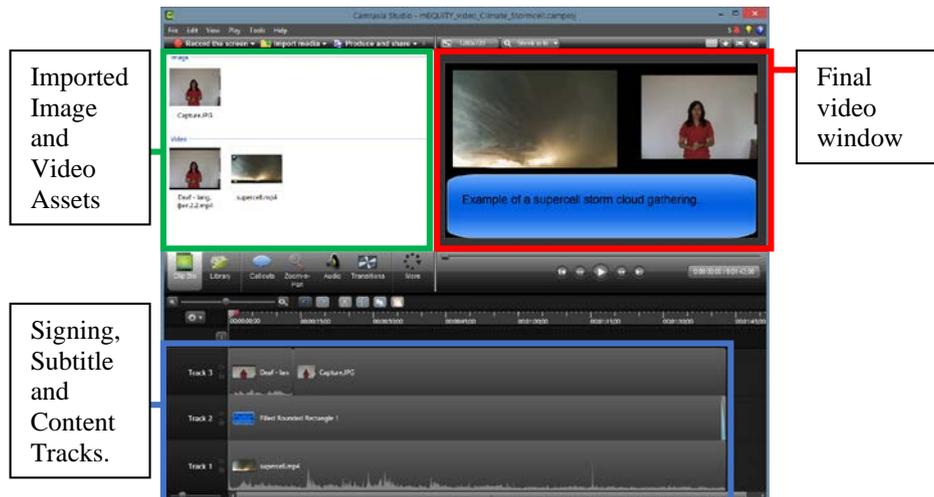
Fig. 1. Screenshot of Camtasia Software project window for a multimedia video with components of signing video, content video and subtitle Callout box.

3.2 Production of Augmented Reality Content

Producing Augmented Reality content was explored using two kinds of software, Aurasma and Unity.

Aurasma is by far the quickest and easiest to demonstrate Augmented Reality content.
The Aurasma app could be downloaded onto a mobile device such as a smartphone or a tablet. Using Aurasma for existing content involved the following key stages:
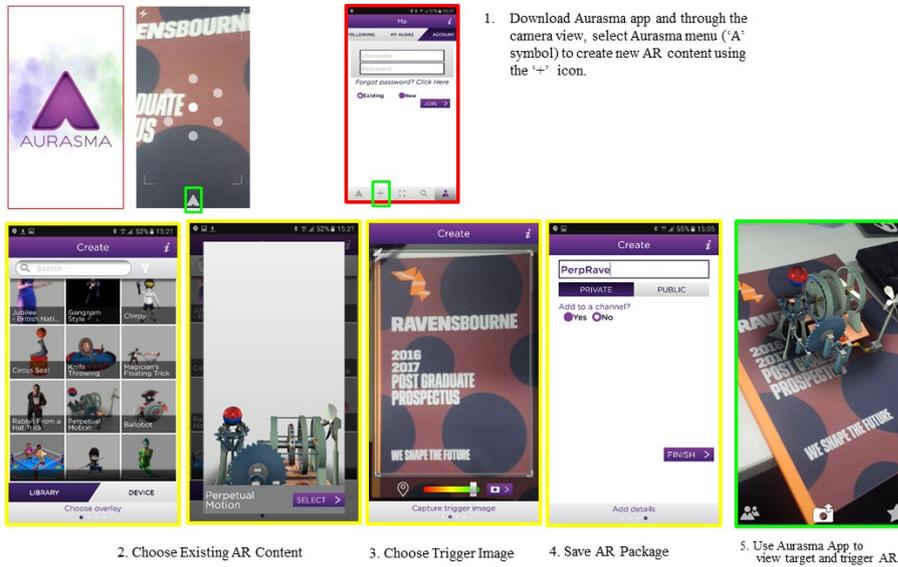

1. Download Aurasma app and through the camera view, select Aurasma menu ('A' symbol) to create new AR content using the '+' icon.

2. Choose Existing AR Content   3. Choose Trigger Image   4. Save AR Package   5. Use Aurasma App to view target and trigger AR

Fig. 2. Mobile device Screenshots of Aurasma AR software key stages of production

If pre-existing content was not suitable then it is possible to go to the Aurasma website, register a user account and load up models that might be suitable.

4 Dissemination of Content

In order to make content available to tutors or students it is possible to create individual experiences for each video, image or model. However, having an app that connects to a server which can deliver the variety of content to a mobile or desktop device would be more sensible. The mRIDGE project has focused on creating an online database of content with an associated app that tutors can log onto and deliver content into classes with. A refinement of this app is currently being created that will have the workflow shown in Fig. 7 below.
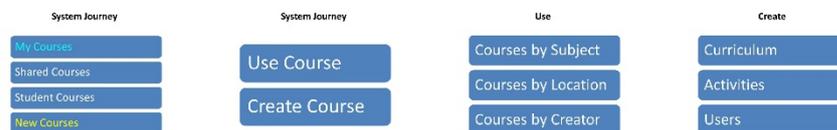
(1) The Home screen of the Dissemination app allows a person to select their own courses through the My Courses option. This allows them to use an existing course or create a new one. When Use Course is selected existing courses

can be viewed by Subject, Location (school, district, city or country) or by the Creator of the course. When Create Course is selected the user can create a new Curriculum or create new Activities for a pre-existing curriculum as well as assign users that can have access to the curriculum as a whole or specific activities.
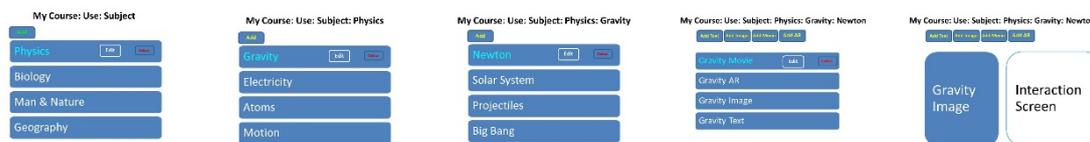
(2) When the user selects Use Course by Subject they can continue to explore by the given subject and its subtopics or use the Add option to add new content at any level. At the deepest level the user can add media including images, video, audio and 3D models in AR or form. The final level allows content to be experienced including through an interaction screen to provide a more active way of learning.

Fig. 7. Mockup of app being created to disseminate Multimedia content created through a central online content server.

5   Implementation of Content

Once the Multimedia or AR content has been created and packaged a program is needed that will serve as an induction for tutors, staff and students at educational institutions, specifically the schools that are partners to developing the mRIDGE deliverables.

The process to do this includes

1.   Survey existing needs of learners and teachers
2.   Produce example learning content that might represent what collections of media need to be generated.
3.   Train staff to act as trainers for other staff, showing how to generate content using the workflows outlined earlier. Evaluate training and improve areas that could be better packaged.
4.   Run pilot trials where workflow training is rolled out to student facing staff.
5.   Evaluate feedback from staff and adjust programmes for future rollout.
6.   Introduce samples of multimedia or AR content into existing curriculums and expose students to learning from the content generated.
7.   Evaluate feedback from students and also through assessment outputs to determine if media needs to be different in delivery or in content.
8.   Reiterate the above steps at regular points in academic curriculum delivery cycles.

If the implementation follows the above cyclical process then there is a good chance that introduction of new technology enhanced learning projects will be successful

6 References

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5. 3DSMax, 3D modelling, http://www.autodesk.com/products/3ds-max/
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