Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science-RELAB

Project Intellectual Output 1

Mechanisms and standards for open educational resources *(OERs) creation and publishing

"This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

BASIC DATA

Project Title:

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

Project Acronym: RELAB

The project time span: March 1st, 2021. – February 28th, 2023. *(24 months duration)

National Agency: RS01 Tempus Foundation https://tempus.ac.rs

Budget: 143.295,00 EUR

Partners:

University of Kragujevac, Kragujevac, Republic Serbia	**National University for Distance Education, UNED, Madrid, Spain**
University of Tartu, Estonia	**University Singidunum, Belgrade, Republic Serbia**
University of Belgrade, Republic Serbia	**Cognipix doo, Belgrade, Republic Serbia**

The main goals in the RELAB project are

1. To support digital education and laboratory teaching through an innovative concept of creating a joint repository of high-quality short videos of representative experiments.
2. To generate comprehensive instructions for the development of online labs for programming and application of specialized hardware.

The subject of the project

- The subject of this project is a strategic partnership for creation and publishing of Open Educational Resources in a joint repository or within networked open repositories.
- The project is focused on the following types of Open Educational Resources:
  1) **"One-minute experiments" (OMXs)**,
  2) **"Digital twins" of real experiments** (as an innovative software integrated model of complex family of real experimental fragments), and
  3) **Web Laboratories** (in terms of supporting the building of new web labs).

Note: Repository of OMXs doesn't exist yet. Repository of OMXs can be very useful resource for new digital textbooks and other teaching materials

Mechanisms and standards for open educational resources creation and publishing

Introduction

RELAB Erasmus+ KA2 project ref. no. 2020-1-RS01-KA226-HE-094550 foresees creations and publishing of following kinds of open educational resources (OERs)

1. One-minute experiments,
2. Digital twins of experimental realizations,
3. WEB - Laboratories, and
4. Tutorials for exemplary creation and publishing mentioned OERs

Our goal is to promote creation, publishing and use of high quality open educational resources. In order to reach our goal, we should define standards and mechanisms in order to define and disseminate activities in creation, publishing and use of high quality open educational resources.

Quality assurance standards and mechanisms of "One-Minute Experiments" repository

"One-minute experiments" *(OMXs): Definition, metadata, and proposal for standards in creation, publishing and use of OMXs

Definition

By "One-minute experiment" we mean a video (clip) that in the shortest possible time, in a clear and effective way, illustrates the phenomenon, theoretical concept, physical law, laboratory exercise, technical solution, principle, conclusion, or theoretical result.

"One-minute experiment" should be important educational content and support, which can include

- Mini – lecture or mini - lesson,
- Video clip of an experimental realization.

The mini-lesson should replace the teacher for up to 3, 5 or 10 minutes in the most effective way in explanation of an important methodological unit in an adequate teaching and learning environment. For example, one term in programming teaching can be explained by a combination of writing on a whiteboard, accompanying text and sound, the state of the program code in the editor, the execution of part of the program, etc. The idea is to provide students with important methodological units that can be explained in a relatively short time. Moreover, trivial issues, such as how to use an oscilloscope or unimer, can be effectively addressed in this way, and always be available to students through an open repository. Mini-lessons can be seen as basic elements or "puzzles" that can often be used as part of a variety of teaching units, preparation for laboratory exercises, a reminder or tool for students in clarifying essential concepts or implying elementary concepts and knowledge, or basic building elements of future intelligent tutors. Mini-lessons have the characteristics of a scientific-educational show on a defined elementary topic.

Video-clip of an experimental realization should substitute a demonstration laboratory exercise in the most effective way. The way of presenting the video clip should be complete and provide all the information that respects the ethical and scientific-educational norms of an experimental realization.

Illustration of One-Minute Experiments & Mini Lectures and their use

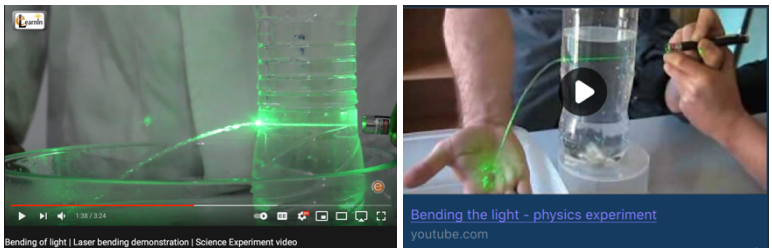


Fig.1. Some YouTube examples (YouTube - Key words: Bending of light | Laser bending demonstration | Science Experiment Video):

a. https://www.youtube.com/watch?v=hBQ8fh_Fp04

b. https://www.youtube.com/watch?v=ifbCsha7Syc

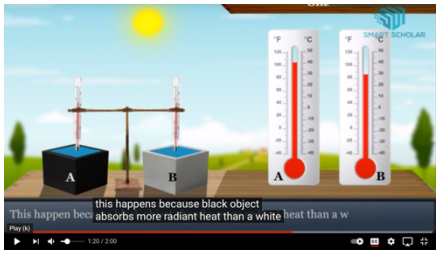


Fig.2. Some Twitter and YouTube examples:

a. https://twitter.com/valaafshar/status/1394827000519577600?s=21

b. Mini lecture https://www.youtube.com/watch?v=DIfzIXmGth0

Fig.3. Via digital markers (QR codes, web links, etc.) - Video clips from the repository can be called from the repository and used in teaching or be part of textbook editions

https://www.youtube.com/watch?v=1EzPJ2cr5fI

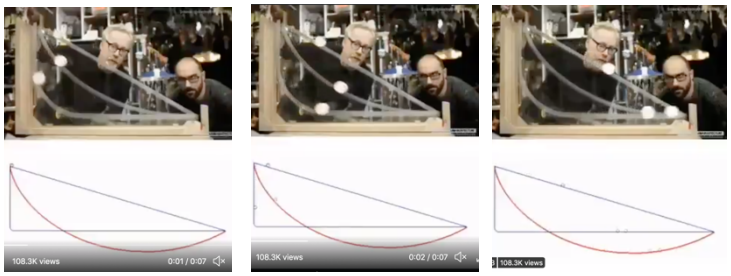


Fig.4. An experiment realization published on Twitter

https://twitter.com/valaafshar/status/1397960689352949764?s=21

In relation to the above illustrative examples, including

- https://graasp.eu/spaces/6086ab9707f23c654ecf2eba

Metadata or determinants for "One-minute experiments" (OMXs)

What about markers, metadata or determinants which can enable search within OMXs repository?

In order to define more general standards, we should previously define metadata for OMXs. Namely, OMXs can be determined by the following set of metadata

1. Title of video clip *(OMX)
2. Purpose of the video clip (illustration, demonstration, popularization, mini lecture, mini tutorial, promotional video clip …)
3. Thumbnail
4. Key words
5. Time duration of video (up to 1, 3, 5 minutes. If longer video content required consider splitting into two or three logically self-contained subunits)
6. Technical characteristics of video clip:
    a. Defined in detail later in the document, per Google's Youtube guidelines
    b. Subtitles should be kept in separate files using standard formats (e.g. srt)
    c. Multilingual options of the video clip is provided
    d. QR code of the video clip is provided
7. The key scientific phenomenon / premise that is **the subject of the video**
8. Area (teaching or scientific area) of the video clip
9. Relevant study or school programs for the use of video
10. Relevant teaching subjects for the use of video
11. Area of continuing education for the use of video
12. Area of popular science for the use of video
13. Teaching units for which the use of video is recommended
14. Goal or goals of the video
15. Description of the video (what are the outcomes, methods, expectations, expected application and outcomes, whether the video implies previous prior knowledge and which, what age of the user the video is intended for or is adapted to all ages)
16. Does the video contain elements of virtual or augmented reality?
17. Does the "One-minute experiment" video enable watchers to repeat or replicate the experiment on their own?
18. Is it safe to perform the experiment on your own?
19. What safety measures are used when performing the experiment?
20. Is there a possible objection to the ethical issues of the video content?
21. Is there a possible copyright complaint regarding the content of the video?
22. Resources
    a. Experimental equipment (specify equipment, structure of experimental setup)
    b. Experimental accessories and consumables (specify)
23. Is the theoretical background of the video covered (citing relevant literature)?
24. Categorization and applicability of video
    a. Video clip for users of the age:
        i. all
        ii. primary school — secondary school
        iii. primary studies — postgraduate studies
        iv. continuing education
    b. It is recommended that the video can be used in a study program(s): _____
    c. It is recommended that the video be used in the school curriculum(s): _____
    d. It is recommended that the video can be used in the subject(s): _____
    e. The video belongs to the following teaching areas: _____
    f. The video belongs to the following teaching units: _____

Use and users of “One-minute experiments” (OMXs)

Creation of "One-minute experiments" is useful for

- digital textbooks creation and improvements (Fig. 5)
- building of intelligent tutoring systems
- building of digital twins of experimental realizations
- all forms of teaching (calling the appropriate video illustrative example from the repository of short video clips "One-minute experiments" can significantly help the lecturer and students, and writers of new textbooks)
- for the purpose of personal educational and research ne

Fig.5. *Illustration of the possible use of "One Minute Experiments"*

The purpose of "One-minute experiments" (OMXs)

Drawings, models, experiments are very important for the human imagination to focus on the study and understanding of phenomena in nature and technology.

"One-minute experiments" aim to integrate text, sound, drawings, models, fragments of experimental realizations in the shortest possible time, through video content, in the most efficient and interesting way, in order to present and/or explain phenomena in nature, science and technology. OMXs should have a great potential for supporting educational processes as well as for popularization of research, science and technology. OMXs can be also distributed through Twitter, Facebook, LinkedIn and use all opportunities of social networks. In this way, OMXs can make a wider influence on society than conventional contents in digital libraries. Dictionaries of basic concepts, terms and phenomena can be enriched with illustrations of representative OMXs contents.

The purpose of the "One-minute experiments" is:

- to help users to focus on essential part watched phenomena,
- to help users to focus on only one term, concept, approach or a phenomena,
- to enable availability and repetitiveness of explanations of basic terms and illustrations as well as important elementary parts of learning contents on the clear and representative manner,
- to reduce the level of abstraction of complex physical phenomena and theoretical concepts,
- to accelerate and increase the level of imagination, cognitive abilities and knowledge absorption of users,
- to be an option for substitution of demonstrative experiential exercises in order to help the user to correctly and faster understand the content (that has so far been commonly explained through laboratory work or standard textbook literature or via ex cathedra approach),
- to enable a new tools and supplements for existing teaching and blended learning methods,
- to support processes of digitalization in education as well as concepts of open education and science,
- to be a digital version of demonstration lab exercises that can be used in a representative edition from anywhere at any time,
- to serve as an adequate replacement for laboratory exercises, especially in case of lack of real laboratory teaching (which is a real possibility in the conditions of

COVID19, but also a frequent occurrence in schools where technical or human resources are lacking).

The purpose of the "One Minute Experiments" repository is:

- to offer an adequate selection of representative "One Minute Experiments" and enable reliable use for all users from any place at any time.

Tips and standards for creating OMXs

or

Towards standards and advisory for creating OMXs video clips

It is recommended that "One-minute experiments" are produced in accordance with the technical instructions (tutorial) on recording, which will be one of the intellectual outputs of the RELAB project.

- OMX's creators should previously define metadata for planned OMX, especially purpose and aims. Scenario draft is desirable.
- Obviously successful OMXs should be used for analysis and conclusion generation of new standards, paradigms and guidance for OMXs creation, publishing and use.
- The recommendations and standards proposed by the RELAB Quality Assurance Committee (QAC) can be improved or modified by the Institutions to which their implementation is proposed. In this way, the sustainability of the project results can be ensured. During the project realization, the RELAB QAC will be collecting and discussing all feedback information and updating its standards and recommendations for the entire duration of the project.
- Short video formats (<3-5 minutes) require careful planning. Spanning beyond this length may imply that it is better to split presentation into two or more logically self-contained videos.
- OMX video clips should have common opening and closing of each video, of limited duration (3-5? seconds), with RELAB logo visible and common concluding remarks (for RELAB participants during the project realization). In general case, it should enable general opening and closing template for each video *(necessary symbols, statements, declarations and information).
- It is important to understand the audience. Getting to know their pain points and clear learning objectives will help in making right decisions and compromises during the OMX creation process.
- It is necessary to explain the scientific phenomenon that stands as a premise at the very beginning of the experiment. It is necessary to pay attention to language, speech and pronunciation, all in order to maintain the academic level of the Repository. The sentences used should be short, clear and concise, without unnecessary details that burden the recording and the experiment itself. Then you need to explain the methods that will be used in the experimental exercise, the type of laboratory equipment,

chemicals and the necessary equipment. It would be crucial to emphasize the precautions that would be applied in the real experiment as well as the type of personal protective equipment that would be used. Attention should be paid to the method of recording / collecting results, their analysis, tools / materials / theoretical models used for data processing / analysis and a clear explanation of the choice of method. The methodology of experimental work must be comprehensive, but also concise in order to convey the idea in the shortest possible time and show the realization of a representative experiment in order to compensate for the presence of students in the laboratory. For this reason, the programmable experimental content allows the viewer to arbitrarily select the input, in terms of initial parameters, and then obtain the appropriate video content in accordance with the system response (experimental settings) and thus be included in the course of the experiment. Such a way of recording video content and programmability of the experiment enables active participation of students in the experimental work with an understanding of the cause-and-effect character of the experiment. It is clear that an audio recording that will accompany at least part of the recorded video experiment is necessary.

Academic style guides in a specific scientific field can also provide detailed guidance on what to include for different types of studies.

- Video format is an important decision point:
  - Live-Video shooting,
  - Animation,
  - Augmented reality (AR),
  - Screencast, or
  - Combination of these.

For RELAB project purposes, Live-Video shooting should be used for at least 50% of “one minute video” output with or without augmented reality (AR).
A combination of the animated part of the schematic representations that follow the theoretical part of the presentation and the recorded procedure of performing the experimental exercise can be created. During the recording, frame the experimental exercise as narrowly and neutrally as possible, without elements that could distract from the experiment itself, e.g. props unnecessary for the exercise itself. The demonstrator should be depersonalized, i.e. only the torso and arms performing the experiment should be framed during the exercise. It is recommended that the entire equipment be shown in static frames, and that parts of the equipment be highlighted with zoom or special larger details during operation. It is recommended that the camera be static, or as a light panoramic movement (schwenk) that would follow the action of the experiment. Avoid free movement of the camera from your hand. Avoid shooting with a strong backlight (e.g. if the window is behind the instrument / demonstrator. If this is the only possible shooting position, be sure to illuminate the experiment setting from the front / side, opposite the light source, placing the light source so as not to cast additional shadows.

- We need to build a narrative, with clear audio recording, dubbed after the shooting, in a controlled environment. This will preserve students' focus and let us guide her/him through the experiment.

- The OMX's script and/or storyboarding (storyboard sketch) means that we visually represent every shot of a RELAB "one-minute" video, using simple drawing or perhaps a dedicated software package. If you prefer to hand-draw your storyboard, you don't need to draw boxes for every frame – standardize on template. Alternative, preferred way is to use open-source storyboard workflow, e.g. based on Story boarder and Fountain markup language. It can create PDF output with the storyboard, script too, for easy sharing and reviewing.

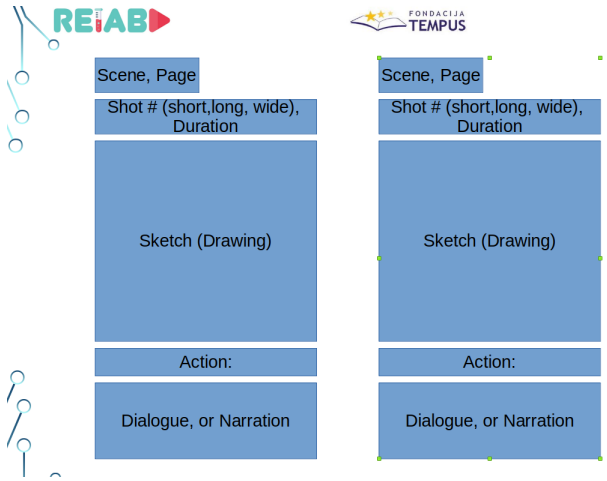


Figure #: Sample storyboard template

- By following each frame, we should understand the visuals and scrutinize which scenes/imagery is serving a learning objective, or what kind of improvements are needed.

- Minimize cognitive workload, as viewers can process a limited amount of information. In addition, this is, realistically, an auxiliary learning process, invoked only to get the quick answer. So, we need to guide the listener/student and avoid overwhelming them either with dense information during narration or too many figures, actions or overlaid texts.

- Prioritize imagery and narration over on-screen text. Trying to process graphics, narration, and on-screen text at once can be overwhelming for viewers. Reduce cognitive load by limiting on-screen text as much as possible. If you can't express the idea through a visual, explain it with narration instead.

- Consider branched scenarios
  eLearning experts often create instructional videos with different scenario branches. A form of learning is like a "choose your own adventure" book. HTML5 format provides all the necessary tools. The learner makes a decision in the course—choosing an answer, clicking a call-to-action button—which causes the video to unfold in a unique way. If you're creating a video with multiple learning paths, be sure to write separate scripts for each scenario to avoid confusion. This material is useful for direct inclusion into digital textbooks

- Make students laugh … (sometimes)
  We should not insist on this, but RELAB video doesn't have to be completely serious. Audience will appreciate a joke or two (or visual gags), as a light break from the lesson. For example, we can create a funny character to be the narrator of the mini lesson.

- Hint what is going to happen next in the video. Viewers are more likely to focus on your instructional video if they have a sense of what is coming next. To make your video easy to follow, include visual cues in your storyboard, such as character expressions and actions or header text.

- Get the review after preparing the script and storyboard, second opinion will matter. From an expert, but also from a student. We should do this before doing the visualization. More details about quality control are in the next chapter.

- We need to ensure that either audio, video or pictures are not copyright protected. Alternatively, get permission from the originator to use their material for the intended purpose. Also, there are repositories of free content (still we will need to list the originator).

- It is recommended that "One Minute Experiments" are done in multiple language variants. Common narrator voiceover across all the OMXs is highly desirable (professional voice overs might be considered), for the same language. Optionally, professional voice overs done by the trained actor can emphasize and express ideas and may not be biased as the original author is. They will make the content more understandable for viewers. Popular online markets also could help.

- Subtitles should be provided in separate files, in standard format, one per language. Subtitles should be formatted with max of 40 characters per line, and if more text is needed, use two lines. Two-line segments must be visible for 5 seconds at least.

- HTML5 and modern browsers allow use of interactive videos. Viewers can click, hover, drag or complete some other digital action, interacting with video content, rather than just passively watching. We can organize several short videos depicting different outcomes of experiments based on user selection. Adding these features increases audience engagement, requesting attention and demonstration of knowledge.

- Do necessary editing. Add overlay text where appropriate, per script, visual effects too.

- Short trailer (<5seconds) is good to have and the thumbnail is important. A student is attracted and decides to watch a video based on a resting snapshot. We should pick compelling, and clear images reflecting the video topic. Trailer could show an interesting scene or two, making a good depiction of the video.

- Hosting video on popular, and easily accessible platforms (e.g. YouTube, Facebook, Instagram, Twitter, etc.)

- Shooting equipment needs to be affordable, yet of good quality. In some cases, high end smartphone cameras are appropriate. DSLRs can provide good quality video recordings.

- Technical aspects of video shooting are rather important.

  - Stabilization is important, and shooting from a tripod is desirable, especially for equipment like DSLR, or other heavier cameras.
  - Ambient lightning needs to be appropriate, recording viewpoints, any many more

- Use free or open-source tools for editing, format conversion, storyboard, etc, to allow easy dissemination of standard.

- For easier insertion of AR elements, we can consider placing easy to detect markers/fiducials, for realistic overlays in post-production (e.g. instrument readings).

- Maybe we should also provide instructions on the color, font and size to be used for subtitles. Or maybe this is something that is not needed at this point because subtitles can be added later and make them consistent between all videos? The same may apply to any virtual visual indicator that may appear in the video, such as arrows, pointers, etc.

- Technical aspects of video formats should follow established standards, like Youtube (Google advisory)

  - Encoding standards: https://support.google.com/youtube/answer/1722171?hl=en&ref_topic=9257782

  - Video resolution and aspect ratios: https://support.google.com/youtube/answer/6375112?hl=en&ref_topic=9257782

  - Suggested audio and video encoders

    - AAC-LC (audio)

Type	Audio Bitrate
Mono	128 kbps
Stereo	384 kbps
5.1	512 kbps

    - H264MP/HP (video)

    - SDR (video, standard dynamic range):

Type	Video Bitrate, Standard Frame Rate (24, 25, 30)	Video Bitrate, High Frame Rate (48, 50, 60)
2160p (4K)	35–45 Mbps	53–68 Mbps
1440p (2K)	16 Mbps	24 Mbps
1080p	8 Mbps	12 Mbps
720p	5 Mbps	7.5 Mbps
480p	2.5 Mbps	4 Mbps
360p	1 Mbps	1.5 Mbps

- HDR:

Type	Video Bitrate, Standard Frame Rate (24, 25, 30)	Video Bitrate, High Frame Rate (48, 50, 60)
2160p (4K)	44–56 Mbps	66–85 Mbps
1440p (2K)	20 Mbps	30 Mbps
1080p	10 Mbps	15 Mbps
720p	6.5 Mbps	9.5 Mbps
480p	Not supported	Not supported
360p	Not supported	Not supported

- Audio, AAC-LC:
- Container format: MP4 (perhaps MKV; other formats can be transformed to MP4 using e.g. ffmpeg)

Quality control and review process of "One-minute experiments"

The RELAB consortium proposes the implementation of standards and procedures for assessing the quality of recorded content through the evaluation of multi-stage experiments to the final version of video content. Several stages in the review of prepared experiments enable continuous monitoring and improvement of quality in terms of content, applicability in the teaching/learning process, appearance, clear and precise presentation that will allow easy understanding of basic principles and the most important phenomena in technical and natural sciences. Different academic styles are expected when it comes to technical or natural sciences, but the internal review process is crucial to provide a clear and useful video of the experimental realization that will be applicable to students of different specializations.

The quality control process is therefore reflected in the continuous monitoring of the quality of video content and the quality of resources required for the successful implementation of the construction of the Repository.

The authors of "One-minute experiments" are recommended to apply the procedure of appointing reviewers at their institutions, which is identical to the procedure of appointing reviewers for a university textbook or any other publication in education.

Reviewers should take into account the defined set of metadata and RELAB QAC recommendations for OMX creation, publication and use.

The logic of selecting reviewers is the same as for selecting reviewers for a review of a university textbook, auxiliary university textbook, practicum, or collection of assignments.

Reviewers are required to use the recommended review procedure and forms (according to the standards of the institution that appointed them, which should respect the standard of the "Repository" in which the video content will be published).

During the implementation of the project, REALB QAC will, in accordance with the needs, organize the review process for submitted OMXs and / or publication of the QMX contents in accordance with the reviews *(which can also be organized by higher education institutions).

After the realization of the project, the process of reviewing and publishing OMXs content will be established without the direct participation of RELAB QAC, based on the procedures, recommendations and established standards created until then.

Publishing

After the implementation of the review procedure and the adoption of positive reviews, the technical publishing realization will be carried out by the RELAB team during the project. The publication of successfully created OMXs contents will be initially carried out on the project website, the project's YouTube channel, the project's github pages, Facebook, Instagram and the project's Twitter profiles.

The goal is to enable the review process and publication procedure even after the realization of the project.

Therefore, the RELAB QAC recommends a review procedure from higher education institution *(REALAB QAC can adopt HEI's and reviewer's reports, or to organize the entire review process).

During the RELAB project, a "One Minute Experiment" with two reviews will be submitted to the RELAB editorial board via the RELAB project website.

Publishing procedure should include selectivity and excellency of published contents as well as search options and reliable use of published OMXs within the repository for different purposes in the contexts educational applications (whether "One-minute experiments" can be easily and reliably called and used as needed within intelligent software tutor systems for teaching, forums of various portals, glossaries, etc.).

If possible, representative experimental realizations should also be published within the repository https://data.mendeley.com. OMX should cite the published dataset.

During the RELAB project, the publication procedure will be defined after the RELAB project. First of all, the publishing capabilities of the YouTube portal were tested with already established publishing procedures. This solution is simple enough and meets the criteria for a basic single international repository. Also, this solution can be adapted and expanded, by supporting the repository with browser functions from the project site, but also with administrative publication procedures.

One of the main objectives of the project is to share one-minute experiment videos openly. Moreover, the project aims at supporting anyone to contribute with new videos to the repository to effectively build a bigger video library and increase the variety of topics covered by the videos available in such library.

As such, this document offers a brief manual on how to use the tool we selected to support uploading, editing, subtitling, and sharing videos.

Why use YouTube

YouTube has become a standard of choice for uploading videos to the cloud and share them openly. Some of the reasons that have led to this wide adoption are:

- YouTube is the 2nd largest search engine next to Google. People upload more than 300 hours of video per minute to YouTube, which has more than 1 billion users every month and 4 billion video views every day.

- Not only is YouTube the most popular video platform on the planet, but videos also are highly shareable through social media posts or e-mail, for example.
- With many students using smart phones, video is a great platform to reach them. YouTube is highly optimized for mobile devices and most students are already using it.

The above list, along with the following features, made YouTube the perfect platform and solution for the needs of the current project:

- YouTube allows creating dedicated channels. Channels can be dedicated to specific topics, such as science and/or engineering education.
- YouTube supports adding collaborators to channels. It is easy to add new users as collaborators or contributors to an existing channel and assign them the required permissions.
- YouTube allows adding (multi-lingual) subtitles. Many subtitles' formats are accepted, and a very handy tool to write subtitles manually, is also available.
- YouTube supports adding lots of metadata to videos. Things like the title, a description, tags, etc. can be easily added to the videos.
- YouTube is free. All the above comes free of cost, which is a must to guarantee the survival of the project in the long term.

How to use YouTube

This manual starts by assuming you already have a YouTube account and that this account has been added as a collaborator to a YouTube channel. Once you have logged in with the account with the required role and accessed the channel you want to contribute with a video to, the first step is to enter in the "Upload video" option in the "Create" menu, which button is placed at the top right part (see Fig. 1).

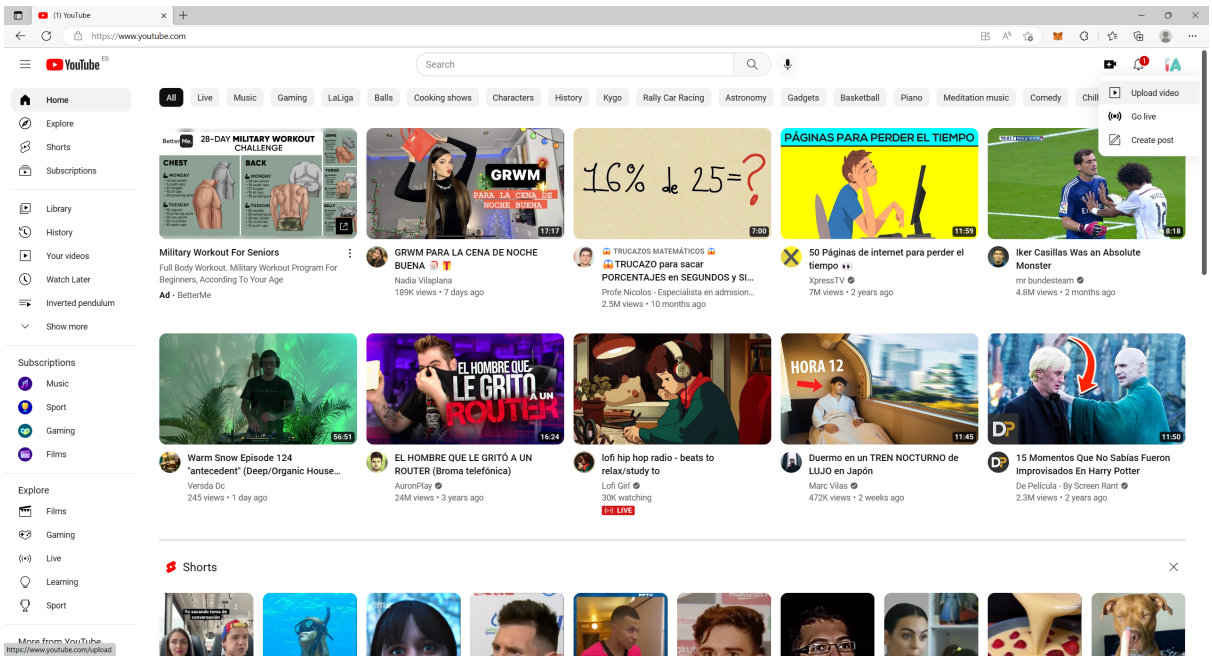


Figure 1: Accessing the "upload video" menu

This opens the option to upload a video, as shown in Fig. 2. Here, the user can select or drag and drop the video of their choice to be uploaded to the YouTube channel.

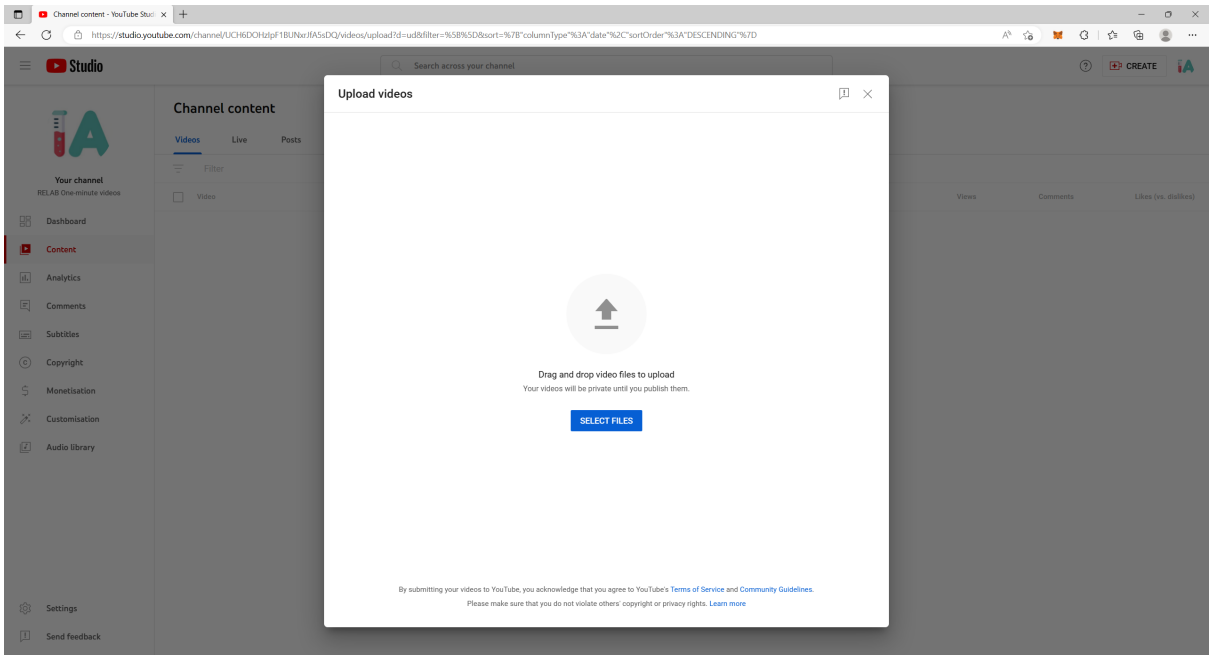


Figure 2: Upload video menu

After choosing or dragging and dropping the corresponding file, the menu changes (Fig. 3) to inform the platform about the details of the video that is being uploaded. First things to choose here are the title, the description, and the thumbnail of the video, which can be either selected among some of the video's frames or uploaded as a new image.

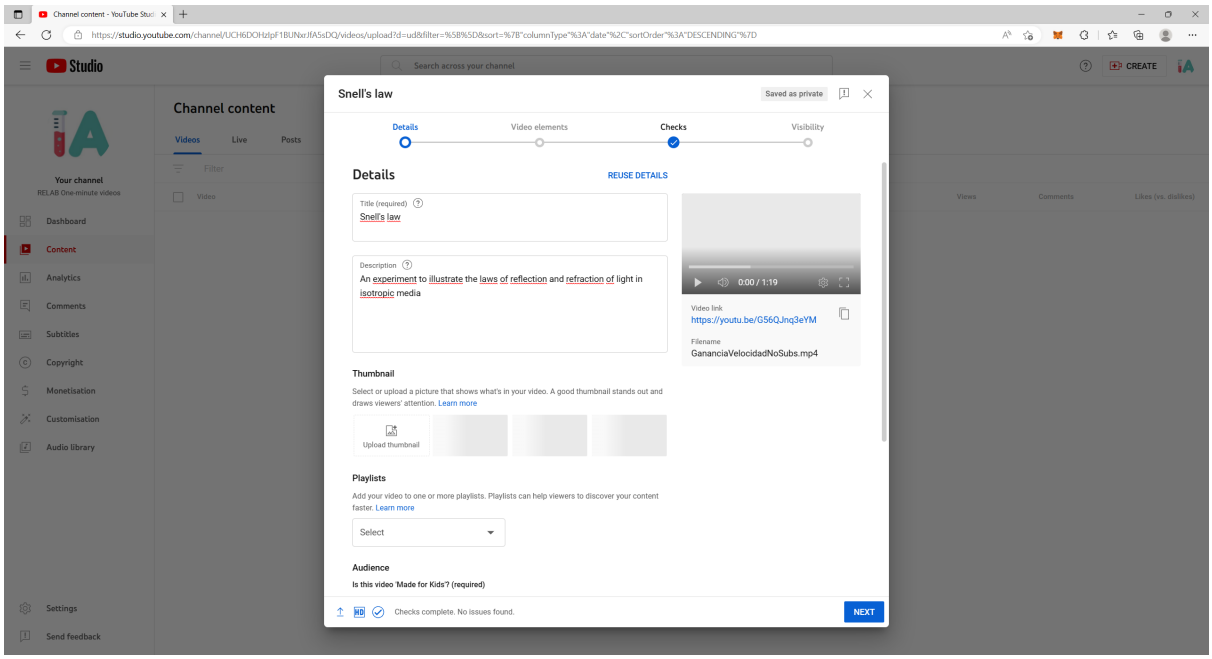


Figure 3: Adding video details

Next, the user can choose to add the video to a playlist or not. If they do want to add the video to a playlist, they can either choose an already existing one, or create a new one, as shown in Fig. 4. Playlists are a very useful feature to organize the videos according to their topic, etc. In this project, playlists are used to gather all videos regarding a certain system, experiment, or phenomena.

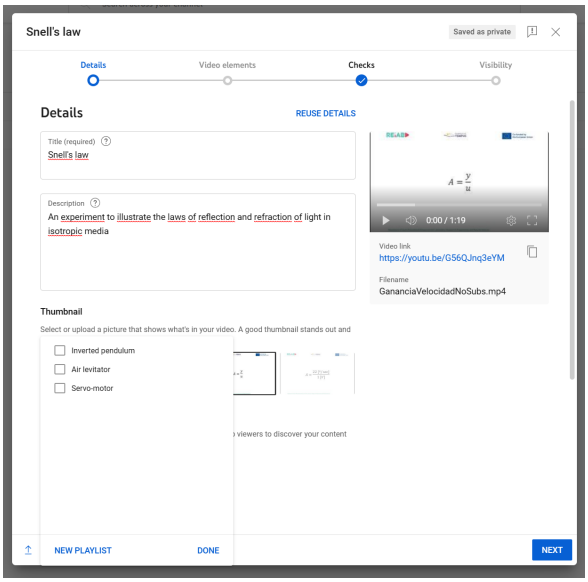


Figure 4: Adding the video to a playlist

The last important option that should be filled when uploading a video, before we review some of the other options under the “Show more” menu, is whether the video has been made for kids or not.

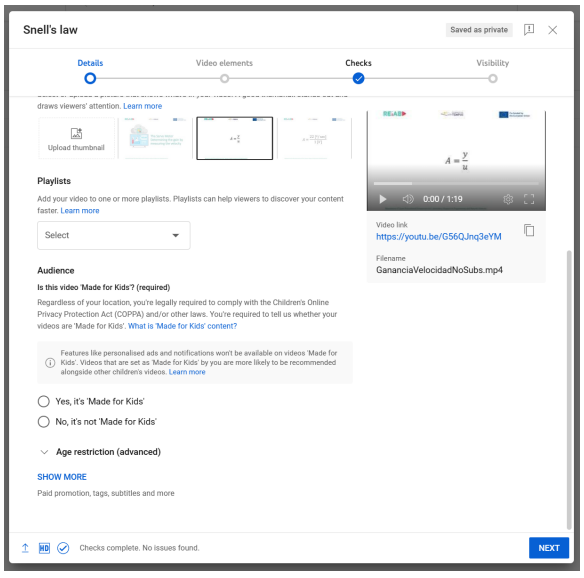


Figure 5: Specifying the audience

Unless the video has been specifically made for teaching kids about a certain effect or experiment (which is not the case in this project, as the audience is primarily university students), users should select the second option: “No, it’s not ‘Made for Kids’”.

When “SHOW MORE” is pressed, more options appear (Fig. 6). Here, it is important to highlight two important fields: “Tags” and “Language”. For the first, users are recommended to fill the same tags included in the metadata sheet filled for the video. For the latter, “English” is the default choice, and should fit the language used in the title, description and tags.

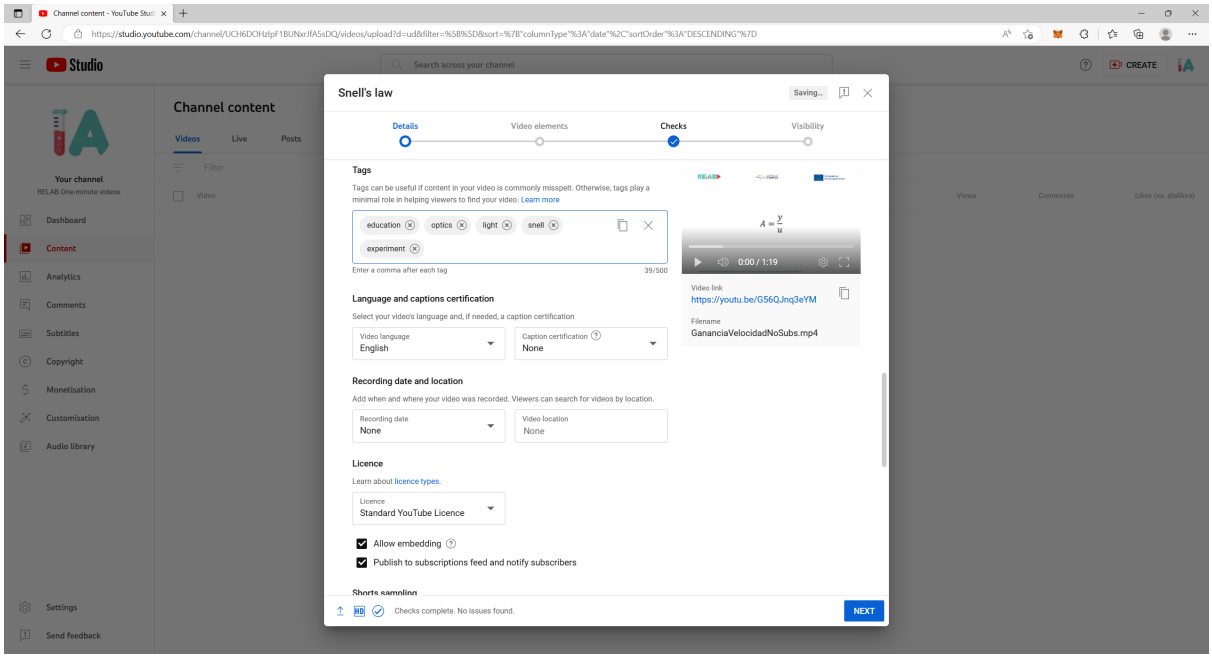


Figure 6: More options

Once finished, pressing the “NEXT” button at the bottom right part of the menu, leads to the second step in the process (Fig. 7). Here, the most important thing to do is to add the subtitles.

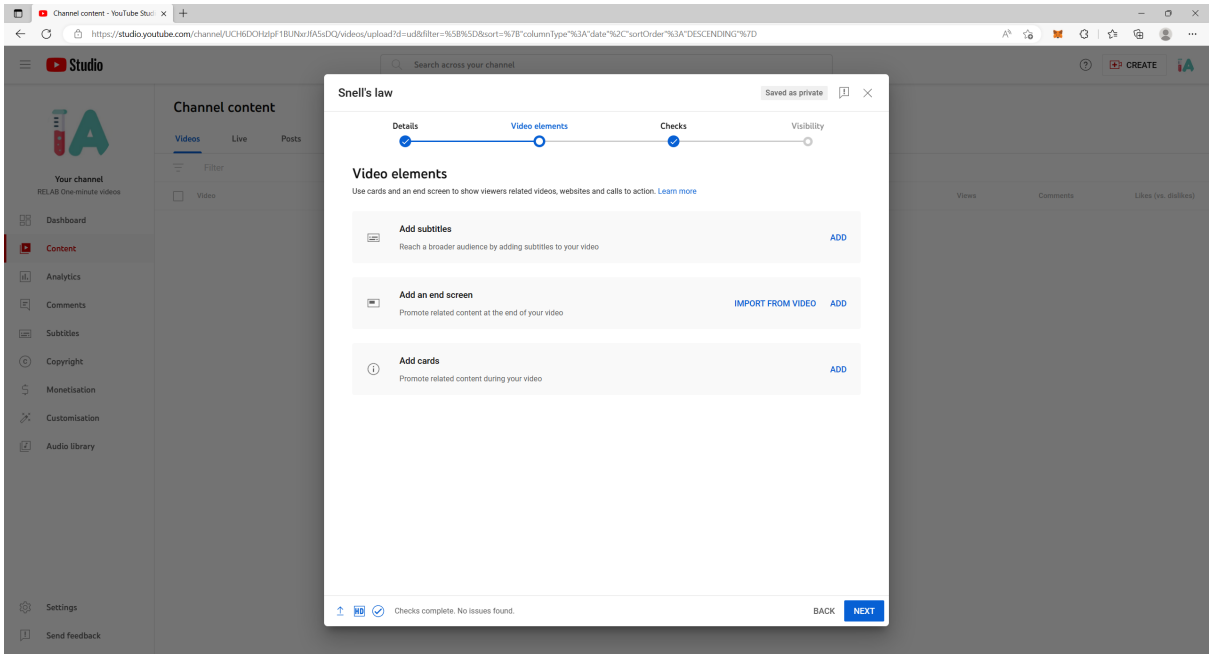


Figure 7: Video elements

Adding subtitles can be done either uploading a file in one of the supported formats, or manually. The first option does not require too much explanation, so here, we focus on the second one. Fig. 8 shows the menu to enter subtitles manually, which basically requires to: 1)

select the starting time, when the subtitle's text portion will be displayed, 2) select the ending time, when the text will disappear, 3) write the text itself, and 4) repeat for each subtitle's text portions as required.

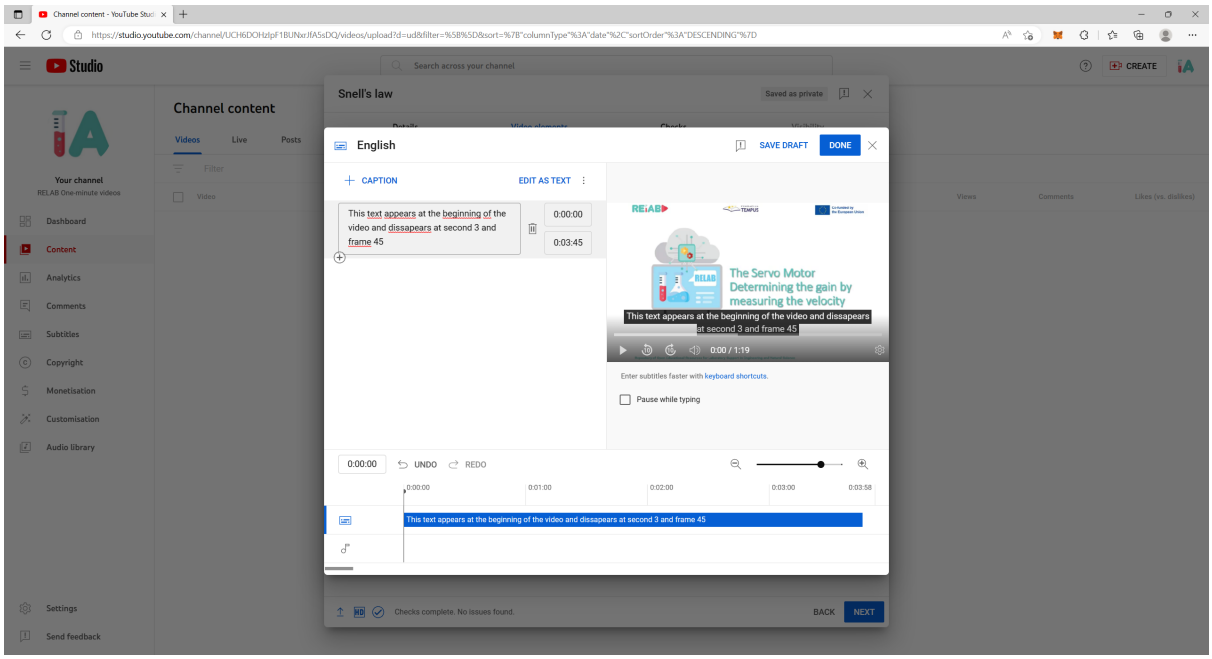


Figure 8: Adding subtitles manually

It is important to mention that starting and ending times are informed as: minute:second:frame.

To enter a new portion of text, click the "+" button at the bottom left corner of the previous portion of text.

The third step in the process of uploading a video to YouTube is to go through some checks that the platform automatically performs for us.

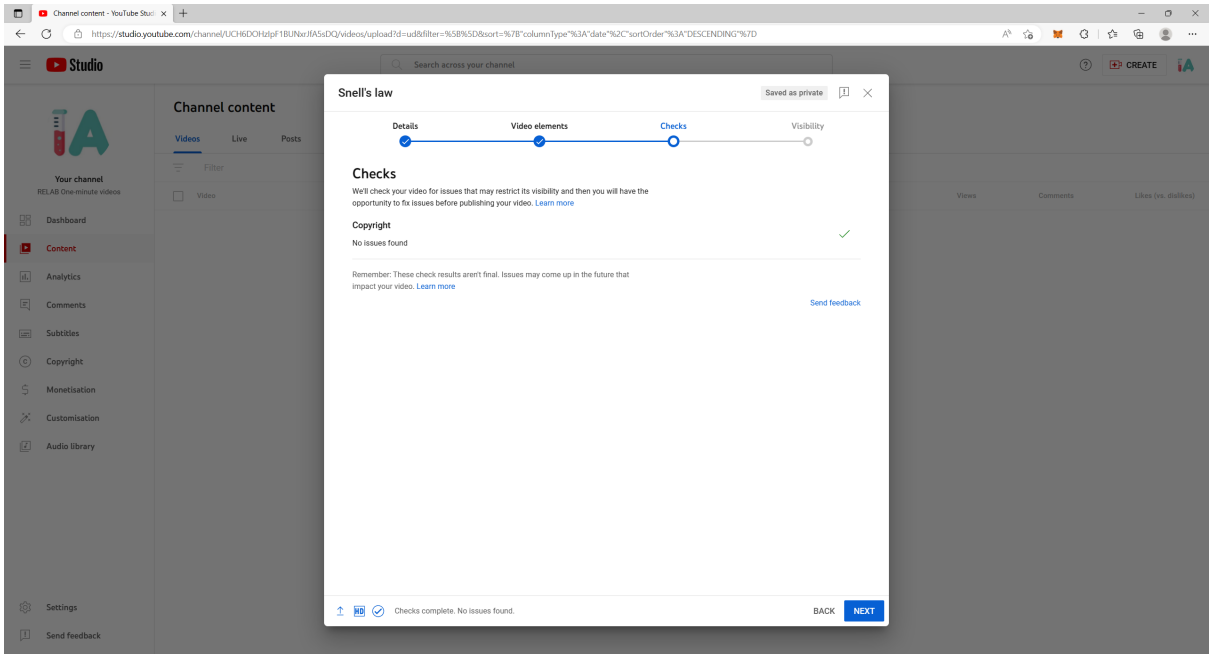


Figure 9: Checks

The last step is to choose the visibility and schedule of the video. Here, it is enough to select “Public”. To finish, just press “PUBLISH” at the bottom right part of the menu.

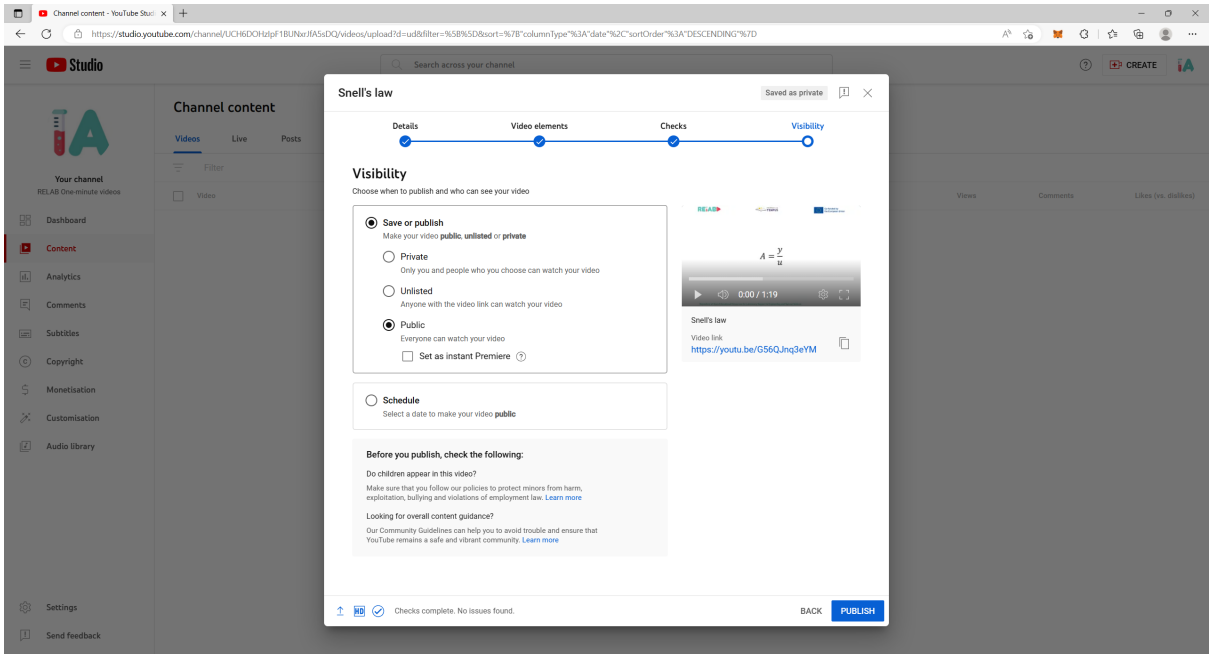


Figure 10: Visibility

Adding new languages to the subtitles can be done after the video has been published. For this, enter YouTube Studio, as shown in Fig. 11.

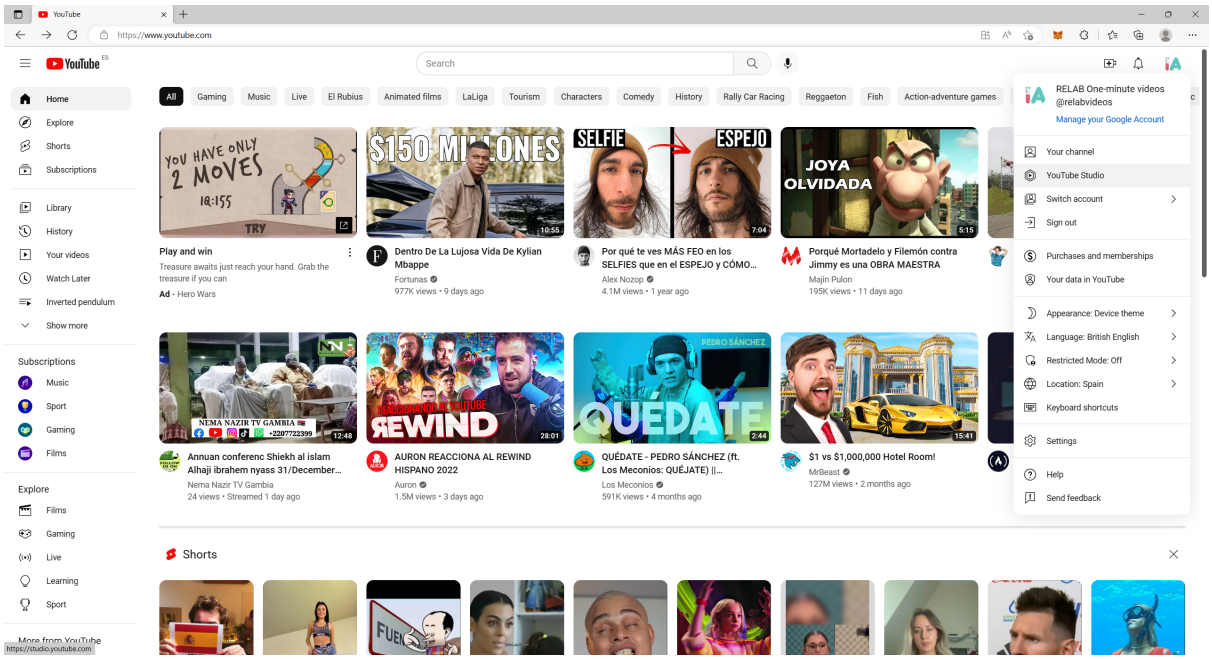


Figure 11: Entering YouTube Studio

Then, click on “Subtitles”, in the menu bar at the left.

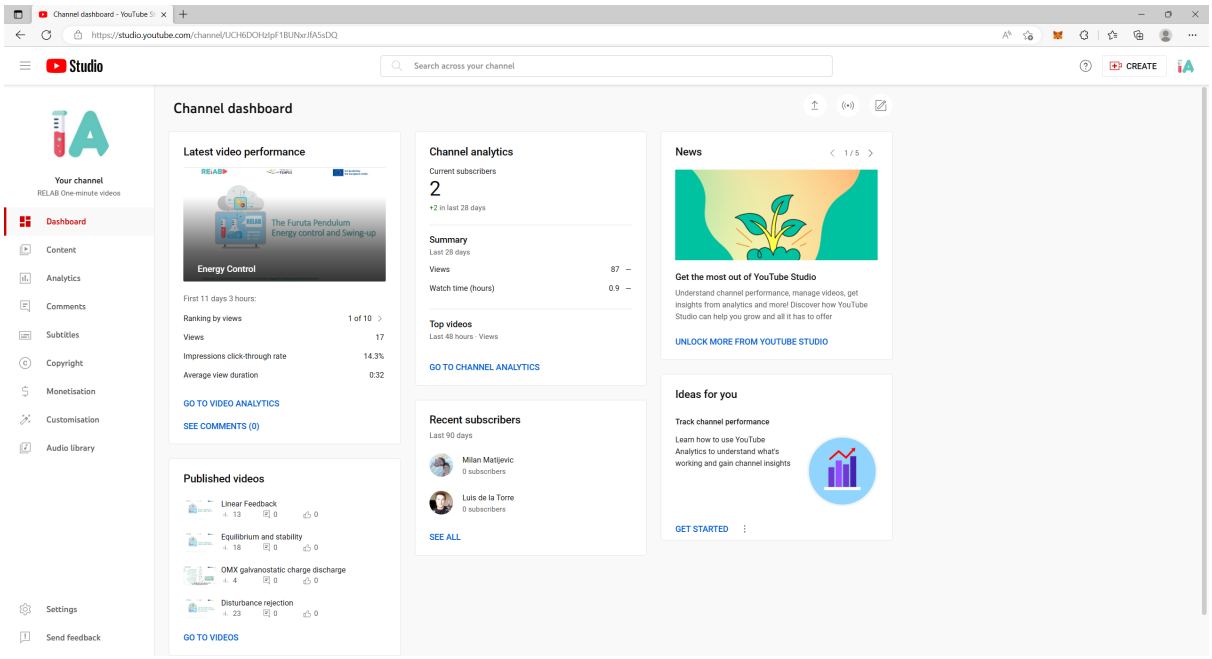


Figure 12: YouTube Studio

Once in the subtitles menu (Fig. 13), search for the video you want to add or edit subtitles for and click on it. You will get a list of subtitles that have already been added to it (Fig. 14).

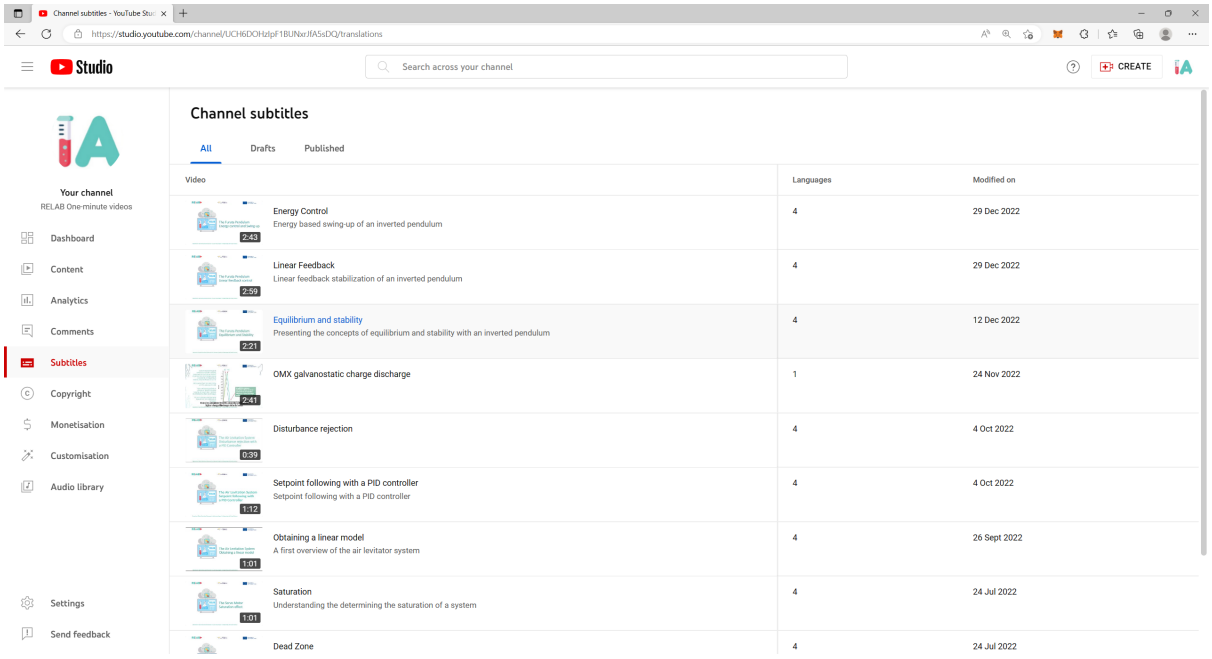


Figure 13: Subtitles menu for all videos in the channel

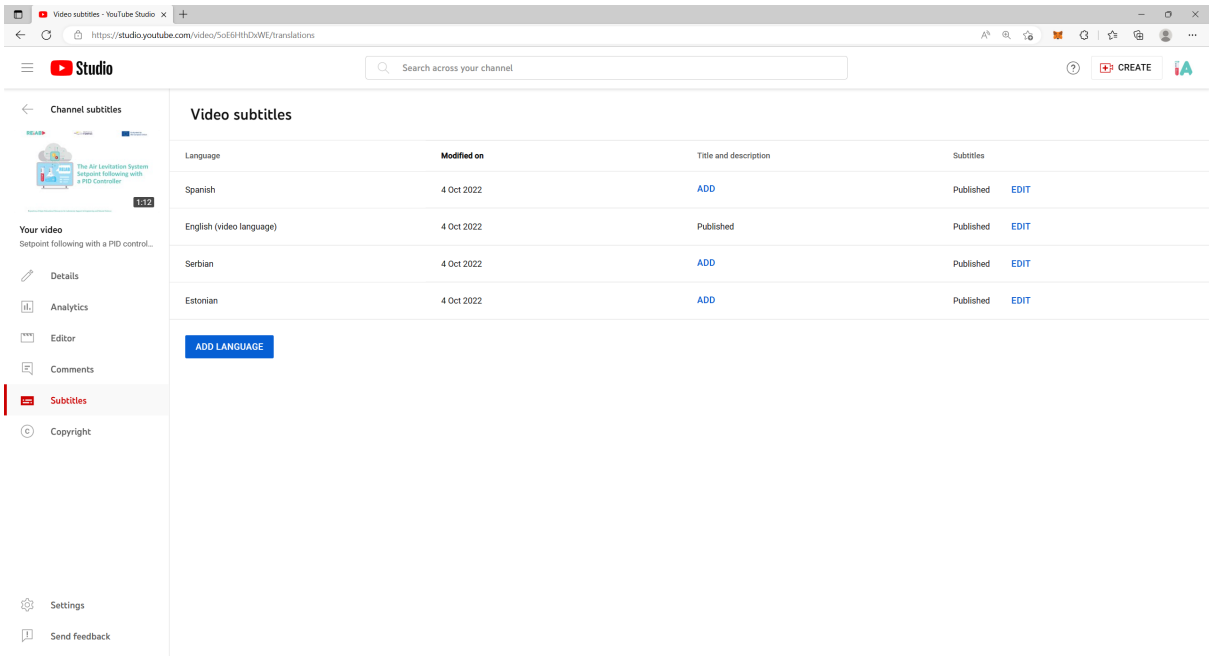


Figure 14: Subtitles added to a video

If you want to add a new language, click on the "ADD LANGUAGE" button, choose the language of your choice and select the method to upload the new language. Options for this are: uploading a file with the subtitles, enter them manually or, more interestingly, using the automatic translation tool from YouTube/Google. With this option, all texts will be translated from the original language the user used for the subtitles (typically, English) to the new language they selected. After this process has been completed, the user can still review the translation to fix any error and improve the translation.

Submission of open education content for publication

The author submits an open educational resource (short video, mini-lesson, ...) for review in the following form:

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science
Co-funded by the European Union

PROCESS OF REVIEW AND PUBLISHING OF OPEN EDUCATIONAL RESOURCES WITHIN RELAB REPOSITORY / form F1 /

For the purpose of publishing open educational resources (OER) in the RELAB repository, I am submitting for review a _____ *(type of OER)* entitled

Title of open educational resource

and the following associated metadata (attached below).

Author name and surname, and affiliation

Metadata for submitted open educational resource (OER)

OMX reference	
Title of OER	
Abstract **(up to 300 words)**	
Authors *or the entity that undertook the production* ***E-mail contact address***	*E-mail:*
Key words	
Literature (list of references)	
Area(s) / Narrow area(s) / Course(s)	
Subject of OER	
Aim(s) / **Purpose(s)** of the OER	***Objective:*** ***Purpose:***
Outcomes of the OER	***Outcome:*** ***Users:***
Language	*Mother language (and Mother language subtitle), English subtitle*

Metadata for submitted open educational resource (OER) with a proposal of possible reviewers or previous reviewer procedure at HEI

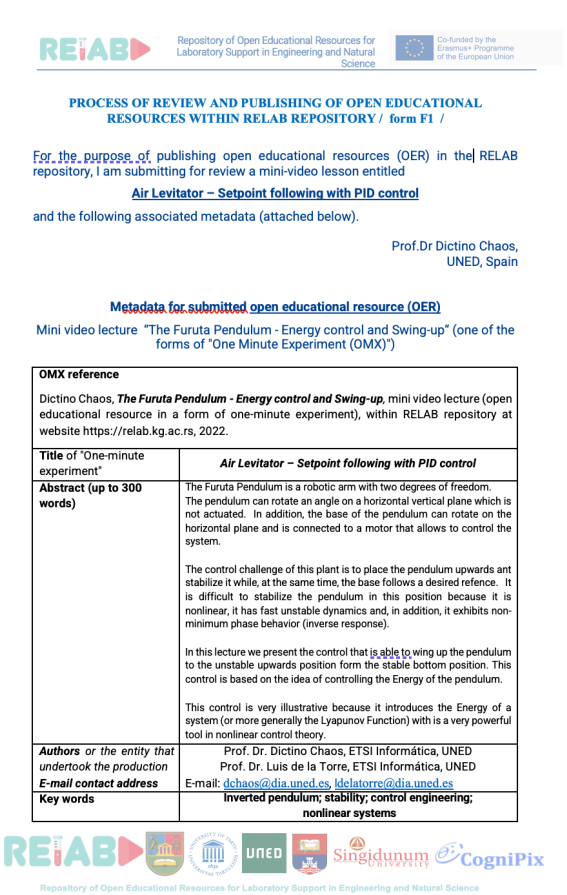
OMX reference	
Title of OER	
Abstract **(up to 300 words)**	
Authors *or the entity that undertook the production* ***E-mail contact address***	*E-mail:*
Key words	
Literature (list of references)	
Area(s) / Narrow area(s) / Course(s)	
Subject of OER	
Aim(s) / **Purpose(s)** of the OER	***Objective:*** ***Purpose:***
Outcomes of the OER	***Outcome:*** ***Users:***
Language	*Mother language (and Mother language subtitle), English subtitle*
Proposal of possible reviewers	1. *Name and surname, Affiliation, E-mail* 2. *Name and surname, Affiliation, E-mail* 3. *Name and surname, Affiliation, E-mail*
Has the previous review procedure at the Higher Education Institution already been carried out, and if so, state and submit the documentation that confirms it	

The form should be filled in both in English and in the native language, while an additional form with the proposal of reviewers is desirable, but not necessary. In addition to the PDF file with metadata, it is necessary to send the video or primary multimedia educational resource with separate subtitle files in both native and English languages (while, for example, the RELAB project maintains the practice of 4 subtitles). In the context of the given examples, we emphasize that video whose production is not financially supported by the RELAB project does not have to contain RELAB project marks (RELAB logo, Erasmus+ logo, etc.).

The RELAB project promotes that higher education institutions in their regular procedures conducts quality assurance control of multimedia educational resources (OERs) and/or open education resources; and can approve publishing and use of new OERs in different multimedia forms adn recognize its as regular teaching/learning aids.

If the home higher education institution does not have adopted procedures for reviewing and publishing open educational resources or multimedia teaching/learning materials, authors can proceed according to the Guidelines for authors for submission of open educational resources for peer review and publishing in the RELAB project repositories (https://relab.kg.ac.rs/dist/#/Home and https://www.youtube.com/@relabvideos/about).

Examples of submitted requests for review and publication of open educational content with associated metadata:



Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

Co-funded by the Erasmus+ Programme of the European Union

PROCESS OF REVIEW AND PUBLISHING OF OPEN EDUCATIONAL RESOURCES WITHIN RELAB REPOSITORY / form F1 /

For the purpose of publishing open educational resources (OER) in the RELAB repository, I am submitting for review a mini-video lesson entitled

Air Levitator – Setpoint following with PID control

and the following associated metadata (attached below).

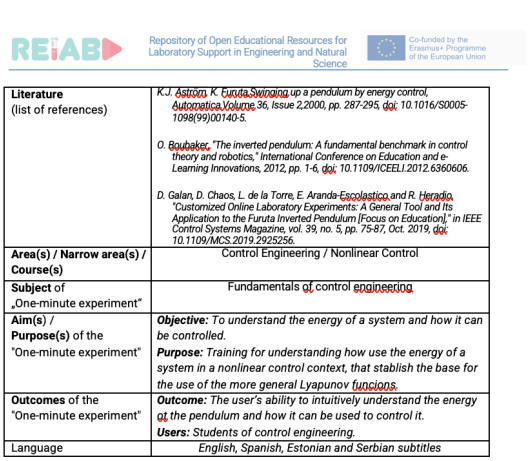
Prof.Dr Dictino Chaos,
UNED, Spain

Metadata for submitted open educational resource (OER)

Mini video lecture "The Furuta Pendulum - Energy control and Swing-up" (one of the forms of "One Minute Experiment (OMX)")

OMX reference Dictino Chaos, ***The Furuta Pendulum - Energy control and Swing-up***, mini video lecture (open educational resource in a form of one-minute experiment), within RELAB repository at website https://relab.kg.ac.rs, 2022.	
Title of "One-minute experiment"	***Air Levitator – Setpoint following with PID control***
Abstract (up to 300 words)	The Furuta Pendulum is a robotic arm with two degrees of freedom. The pendulum can rotate an angle on a horizontal vertical plane which is not actuated. In addition, the base of the pendulum can rotate on the horizontal plane and is connected to a motor that allows to control the system. The control challenge of this plant is to place the pendulum upwards ant stabilize it while, at the same time, the base follows a desired refence. It is difficult to stabilize the pendulum in this position because it is nonlinear, it has fast unstable dynamics and, in addition, it exhibits non-minimum phase behavior (inverse response). In this lecture we present the control that is able to wing up the pendulum to the unstable upwards position form the stable bottom position. This control is based on the idea of controlling the Energy of the pendulum. This control is very illustrative because it introduces the Energy of a system (or more generally the Lyapunov Function) with is a very powerful tool in nonlinear control theory.
Authors** or the entity that undertook the production* ***E-mail contact address	Prof. Dr. Dictino Chaos, ETSI Informática, UNED Prof. Dr. Luis de la Torre, ETSI Informática, UNED E-mail: dchaos@dia.uned.es, ldelatorre@dia.uned.es
Key words	**Inverted pendulum; stability; control engineering; nonlinear systems**

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science



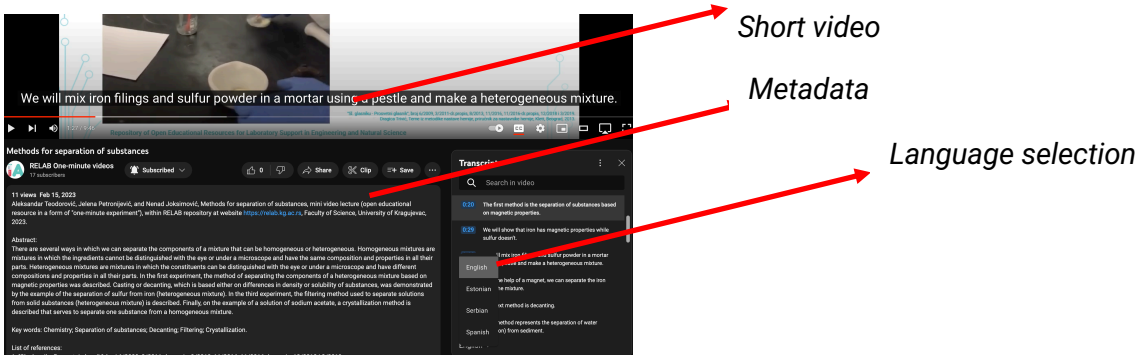
Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

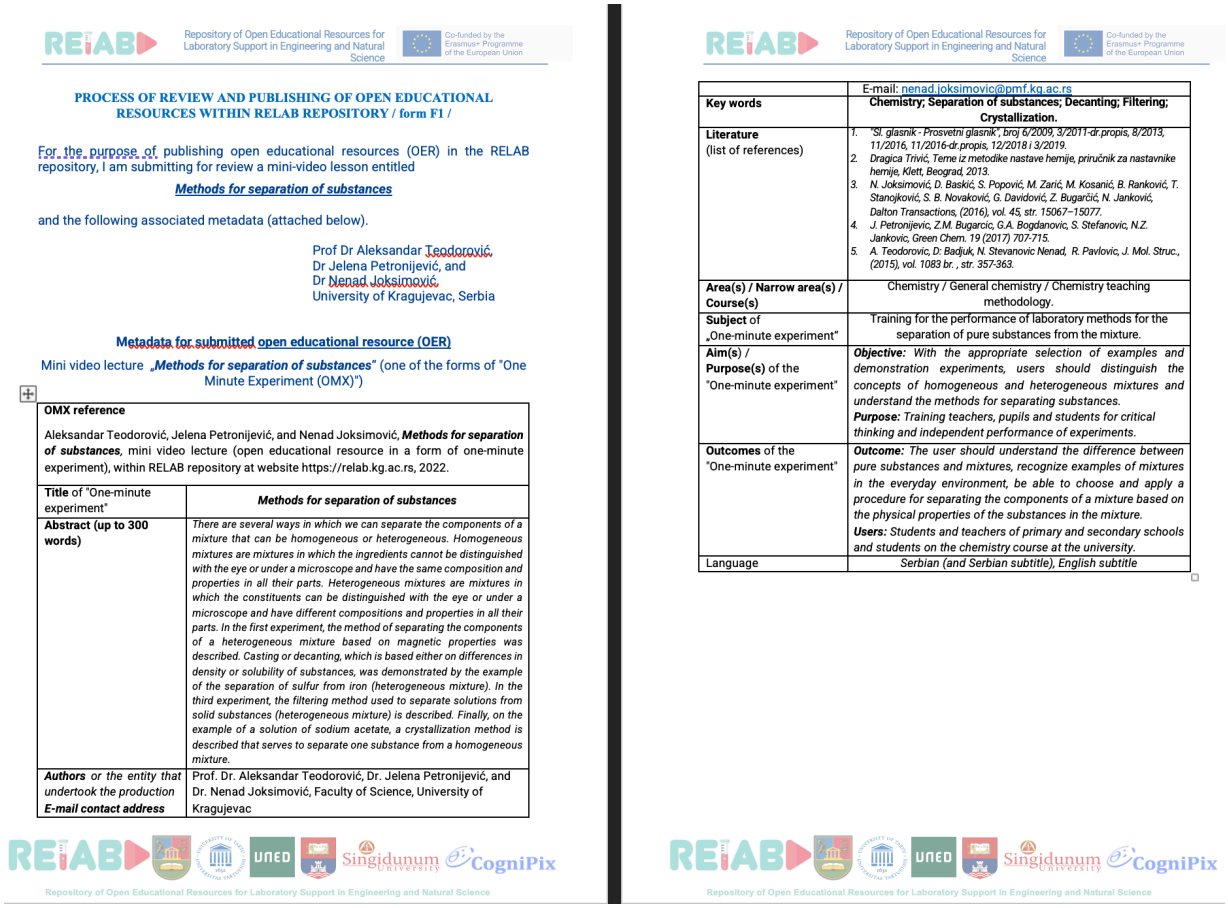
Co-funded by the Erasmus+ Programme of the European Union

Literature (list of references)	K.J. Åström, K. Furuta Swinging up a pendulum by energy control, Automatica Volume 36, Issue 2,2000, pp. 287-295, doi: 10.1016/S0005-1098(99)00140-5. O. Boubaker, "The inverted pendulum: A fundamental benchmark in control theory and robotics," International Conference on Education and e-Learning Innovations, 2012, pp. 1-6, doi: 10.1109/ICEELI.2012.6360606. D. Galan, D. Chaos, L. de la Torre, E. Aranda-Escolastico and R. Heradio, "Customized Online Laboratory Experiments: A General Tool and Its Application to the Furuta Inverted Pendulum [Focus on Education]," in IEEE Control Systems Magazine, vol. 39, no. 5, pp. 75-87, Oct. 2019, doi: 10.1109/MCS.2019.2925256.
Area(s) / Narrow area(s) / Course(s)	Control Engineering / Nonlinear Control
Subject of „One-minute experiment"	Fundamentals of control engineering
Aim(s) / Purpose(s) of the "One-minute experiment"	***Objective:*** *To understand the energy of a system and how it can be controlled.* ***Purpose:*** *Training for understanding how use the energy of a system in a nonlinear control context, that stablish the base for the use of the more general Lyapunov funcions.*
Outcomes of the "One-minute experiment"	***Outcome:*** *The user's ability to intuitively understand the energy of the pendulum and how it can be used to control it.* ***Users:*** *Students of control engineering.*
Language	*English, Spanish, Estonian and Serbian subtitles*

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

In case the reviewer approves the publication of an open education resource, the metadata becomes available in a convenient form along with this open education resources. Let's say





Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

Co-funded by the Erasmus+ Programme of the European Union

PROCESS OF REVIEW AND PUBLISHING OF OPEN EDUCATIONAL RESOURCES WITHIN RELAB REPOSITORY / form F1 /

For the purpose of publishing open educational resources (OER) in the RELAB repository, I am submitting for review a mini-video lesson entitled

Methods for separation of substances

and the following associated metadata (attached below).

Prof Dr Aleksandar Teodorović,
Dr Jelena Petronijević, and
Dr Nenad Joksimović,
University of Kragujevac, Serbia

Metadata for submitted open educational resource (OER)

Mini video lecture ***„Methods for separation of substances"*** (one of the forms of "One Minute Experiment (OMX)")

OMX reference	Aleksandar Teodorović, Jelena Petronijević, and Nenad Joksimović, ***Methods for separation of substances***, mini video lecture (open educational resource in a form of one-minute experiment), within RELAB repository at website https://relab.kg.ac.rs, 2022.
Title of "One-minute experiment"	***Methods for separation of substances***
Abstract (up to 300 words)	*There are several ways in which we can separate the components of a mixture that can be homogeneous or heterogeneous. Homogeneous mixtures are mixtures in which the ingredients cannot be distinguished with the eye or under a microscope and have the same composition and properties in all their parts. Heterogeneous mixtures are mixtures in which the constituents can be distinguished with the eye or under a microscope and have different compositions and properties in all their parts. In the first experiment, the method of separating the components of a heterogeneous mixture based on magnetic properties was described. Casting or decanting, which is based either on differences in density or solubility of substances, was demonstrated by the example of the separation of sulfur from iron (heterogeneous mixture). In the third experiment, the filtering method used to separate solutions from solid substances (heterogeneous mixture) is described. Finally, on the example of a solution of sodium acetate, a crystallization method is described that serves to separate one substance from a homogeneous mixture.*
Authors** or the entity that undertook the production* ***E-mail contact address	Prof. Dr. Aleksandar Teodorović, Dr. Jelena Petronijević, and Dr. Nenad Joksimović, Faculty of Science, University of Kragujevac

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

Co-funded by the Erasmus+ Programme of the European Union

	E-mail: nenad.joksimovic@pmf.kg.ac.rs
Key words	**Chemistry; Separation of substances; Decanting; Filtering; Crystallization.**
Literature (list of references)	1. *"Sl. glasnik - Prosvetni glasnik", broj 6/2009, 3/2011-dr.propis, 8/2013, 11/2016, 11/2016-dr.propis, 12/2018 i 3/2019.* 2. *Dragica Trivić, Teme iz metodike nastave hemije, priručnik za nastavnike hemije, Klett, Beograd, 2013.* 3. *N. Joksimović, D. Baskić, S. Popović, M. Zarić, M. Kosanić, B. Ranković, T. Stanojković, S. B. Novaković, G. Davidović, Z. Bugarčić, N. Janković, Dalton Transactions, (2016), vol. 45, str. 15067–15077.* 4. *J. Petronijevic, Z.M. Bugarcic, G.A. Bogdanovic, S. Stefanovic, N.Z. Jankovic, Green Chem. 19 (2017) 707-715.* 5. *A. Teodorovic, D. Badjuk, N. Stevanovic Nenad, R. Pavlovic, J. Mol. Struc., (2015), vol. 1083 br. , str. 357-363.*
Area(s) / Narrow area(s) / Course(s)	Chemistry / General chemistry / Chemistry teaching methodology.
Subject of „One-minute experiment"	Training for the performance of laboratory methods for the separation of pure substances from the mixture.
Aim(s) / Purpose(s) of the "One-minute experiment"	***Objective:** With the appropriate selection of examples and demonstration experiments, users should distinguish the concepts of homogeneous and heterogeneous mixtures and understand the methods for separating substances.* ***Purpose:** Training teachers, pupils and students for critical thinking and independent performance of experiments.*
Outcomes of the "One-minute experiment"	***Outcome:** The user should understand the difference between pure substances and mixtures, recognize examples of mixtures in the everyday environment, be able to choose and apply a procedure for separating the components of a mixture based on the physical properties of the substances in the mixture.* ***Users:** Students and teachers of primary and secondary schools and students on the chemistry course at the university.*
Language	*Serbian (and Serbian subtitle), English subtitle*

Repository of Open Educational Resources for Laboratory Support in Engineering and Natural Science

Example of a request for review and publication of open educational content with associated metadata

Reviewing of open educational resources

Review sheet

Title of "One-minute experiment"	
Area(s) / Narrow area(s) / Course(s)	
Is the metadata list for the OMX filled in correctly? Please, comment on possible shortcomings.	
Key words	
Subject of „One-minute experiment“	
Aim(s) / Purpose(s) of the "One-minute experiment"	
Outcomes of the "One-minute experiment"	
Possible users of the "One-minute experiment"	
Assessment of the technical standard (give a grade from 0 to 10 with explanation)	
Assessment of educational content (give a grade from 0 to 10 with explanation)	
Assessment of the pedagogical approach (give a grade from 0 to 10 with explanation)	
Short description of the "One-minute experiment"	
Language, terminology, international compliance and relevance	
Reviewer's comments (to editors)	
Reviewer's comments (to authors)	

Example:

RELAB REVIEW SHEET /– in English/

Review sheet for "UNI KG – OMX1 – A model for cost-benefit analysis of individualized drug dosing"

Title of "One-minute experiment"	***A model for cost-benefit analysis of individualized drug dosing***
Area(s) / Narrow area(s) / Course(s)	Medicine / Clinical pharmacology / Individualization of drug dosing
Is the metadata list for the OMX filled in correctly? Please, comment on possible shortcomings.	Metadata list is provided.
Key words	Cost-benefit ratio model; individualization of drug dosage; antibiotics; nosocomial pneumonia;
Subject of „One-minute experiment"	Individualization of drug dosage
Aim(s) / Purpose(s) of the "One-minute experiment"	Assess the cost-benefit ratio of interventions in the health system using a mathematical model / Training for creating a cost-benefit ratio model in the Excel program.
Outcomes of the "One-minute experiment"	Ability of the user to set up a cost-benefit model in Excel.
Possible users of the "One-minute experiment"	Students of medicine and pharmacy
Assessment of the technical standard (give a grade from 0 to 10 with explanation)	(8) The nominal technical standards were mostly respected. Subtitles and RELAB headers are missing in front and behind the current unit of footage financed by the RELAB project.
Assessment of educational content (give a grade from 0 to 10 with explanation)	(10) Educational content is relevant. The meta data of the mini video lesson contains referencing of the literature and they can be attached to the mini video lesson by inserting it into the recording itself or through the accompanying contents of the repository in which the mini video lesson is also contained.
Assessment of the pedagogical approach (give a grade from 0 to 10 with explanation)	(10) The pedagogical approach is at the level of the required standards.
Short description of the "One-minute experiment"	Individualization of therapy means adjusting the choice of drug, method of administration and dosage regimen to the needs of the patient, i.e. its genetic characteristics, comorbidities and concomitant therapy. Optimally individualized therapy increases the percentage of cure, the length and quality of life on the one hand, and on the other hand it reduces the frequency and severity of adverse drug effects. The aim of this work is to evaluate the ratio of the costs of

	individualizing antibiotic therapy and the financial benefit that is achieved by it (cost/benefit analysis). An assessment of the cost-benefit ratio can be made by applying a pharmacoeconomic model, which has as inputs the direct costs of the individualization of therapy, the costs of the therapy itself and the application of the necessary diagnostic methods, and the costs of health services, and as outcomes savings achieved by shortening hospitalization, reducing the consumption of drugs and health services due to faster cures, and by avoiding drug side effects and undesirable interactions. The model uses the perspective of the Republic Health Insurance Fund, and the time horizon is equal to life expectancy minus the average age of patients with hospital-acquired pneumonia. The comparator to individualized therapy is standard antibiotic therapy. The cost-benefit ratio of individualized antibiotic therapy is significantly more favorable than the cost-benefit ratio of standard antibiotic therapy for hospital-acquired pneumonia. The main savings that individualized therapy creates are due to a reduction in mortality, shortening of hospitalization and a reduction in the consumption of antibiotics per patient. If the hospital has clinical pharmacologists or clinical pharmacists, the costs of the individualization procedure are minimal, and the effect is significantly greater. The systematic application of individualized antibiotic administration has great potential for reducing the overall costs of health care in hospitals and creating opportunities for investment in innovative health technologies.
Language, terminology, international compliance and relevance	The language and terminology correspond to international standards. It is necessary to add subtitles in national and English languages, and then it is probably technically very simple to add subtitles in Spanish and Estonian languages as well, which would fit the spirit of the project.
Reviewer's comments (to editors)	The reviewer suggests the editor to allow the publication of the mini-video lesson with previous technical refinement (the subtitle should be added in accordance with the standard).
Reviewer's comments (to authors)	The mini video lesson is extremely useful for both students and teaching staff and for various possible users of lifelong learning.

	Some technical corrections are needed to meet the previously adopted technical standards - subtitle options need to be added, and it would be desirable to place the front of the header before and after the current video (where the title of the video mini-lesson would be placed, the logo of the project, funding, the video, at the end , literature that is linked to the mini video lesson)

Copyright issues - Intellectual property issues

"One-minute experiments" should be organized within the repository(ies) of open educational content.

The authorship of the "One-minute experiment" should be stated according to the standard, and it should be possible to cite the "One-minute experiment".

A “One-minute experiment” is the work of an author or group of authors, who used a specific medium (video production) to present their work, and has a treatment of the work published in an open access journal (in our case, an open access repository)

Quality assurance *(QA)

During the implementation of the project, all quality issues will be in charge of the RELAB Quality Assurance Committee:

Milan Matijevic, **University of Kragujevac**, Kragujevac, Serbia
Luis de la Torre Cubillo, **National University of Distance Education - UNED**, Madrid, Spain
Gholamreza Anbarjafari, **University of Tartu**, Tartu, Estonia
Maja Milojević Rakić, **University of Belgrade**, Belgrade, Serbia
Marko Tanasković, **University Singidunum**, Belgrade, Serbia
Đorđe Seničić, **Cognipix**, Belgrade, Serbia

Continuous development and improvement of quality standards and mechanisms is envisaged during the project realization. The first edition of quality standards and mechanisms will be offered to individuals and committees dealing with these issues in higher education institutions *(HEIs). The proposed standards and mechanisms can be useful for the possible improvements of QA standards and mechanisms at higher education institutions. At the same time, any feedback will be useful in order to improve existing recommendations for standards and mechanisms of quality assurances and improvements. Through an iterative procedure and continuous work, we will achieve the best possible results on all subject issues of the realization of this project.

Digital Twins of Experimental Realizations

When applied to experimental realizations, the Digital Twin – a virtual version of real-life objects that can be used to predict how that object will perform – could predict experimental responses for different inputs.

In our case, Digital Twins should emulate WebLaboratory realizations in order to achieve more possible users at the same time as well as independence from real laboratory hardware.

Digital Twin can be made as a programmable set of characteristic OMXs realizations.

According to the fact that repeated experiments do not have identical responses in reality, digital twins couldn't be based on an expert system composed of typical OMXs realizations, but can include elements of artificial intelligence.

Since a digital twin of experimental realization is based on fragments of OMXs realizations, the already presented recommendations for QA standards and mechanisms for OMXs creation and publishing can also be mapped for the case of Digital Twins of experimental realizations.

Our general methodology is an iteratively improvement of QA rules based on collecting experience during successful phases of the project realizations *(exemplary created OMXs, digital twins, web labs, or open tutorials) as well as based on collecting feedback information. In this way, QA standards for digital twins, web labs, open tutorials, will be more addressed in future editions of this publication during the project realization.

Web Laboratories and their publishing within the Go-Lab repository

The educational courses that fall into Science, Technology, Engineering and Math (STEM) category require an extensive practical training in laboratories, in order to build and strengthen students' skills, thereby preparing them for a future job market. Laboratory support is a necessary part of engineering education, but very often it is missing. For example, according to criteria for accreditation of engineering study programs by the National Accreditation Body in Serbia, laboratory part of engineering education should be organized within groups of 8 MSc or 20 BSc undergraduate students. Trained laboratory staff and 8 or 20 laboratory setups are basic infrastructure for laboratory work. Laboratory infrastructure is typically very expensive. In reality, this limitation causes different kinds of limitations in quality of the educational process: less capacity and quality of laboratory work, hands-on laboratory work is substituted by demonstrative laboratory work, or by remote laboratories.

The role of the web or remote laboratory is to ensure communication between students (from any place at any time) and the experimental setups within laboratories. Number scientific papers and books are dedicated to web laboratories.

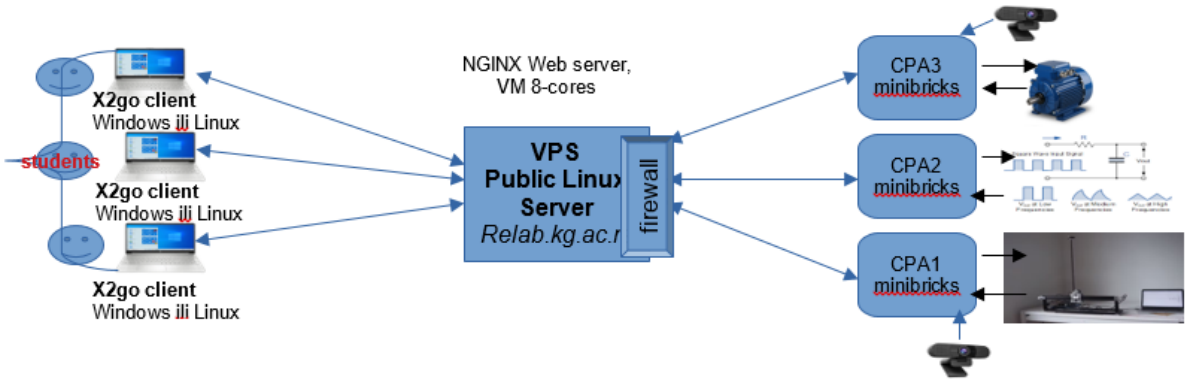


Fig 6. Configuration pilot installation of WEB Laboratory at University of Kragujevac

Fig. 7. *An example of experimental setups belonging to installed WEB Laboratory at University of Kragujevac*

Go-Lab is a repository of web laboratories. We support and promote Go-Lab standards and mechanisms for publishing of web laboratories given by the link https://www.golabz.eu/labs/publish

Tutorials for exemplary creation and publishing OERs

Open educational resources submitted for publishing in repositories should cite tutorials for their creation and publishing.

RELAB project will offer relevant tutorials for OERs creation and publishing on the project site.

Conclusions

The purpose of this document is to propose mechanisms and standards for the creation and publication of specified types of open educational resources in science and engineering. Tutorials for creating and publishing open educational resources can also be considered part of this document.

During the RELAB project, several editions of this document are planned, because it will be continuously worked on based on feedback and own experiences in creating and publishing open educational resources.

The document will be offered to vice-chancellors and vice-deans for teaching, quality assurance committees at universities and faculties, and school principals. We are expecting responses both in terms of possible improvements of this document and in terms of acceptance of the ideas of this document for parts of quality assurance rules of higher education institutions regarding promotion creation, publishing and use of new OERs, as well as individual teaching organization and teaching practice.

Teaching editions such as practicums, collections of assignments or auxiliary university textbooks, nowadays should equally include, when assessing the qualitative contribution of teachers to the teaching process, digital publishing of open educational resources. We hope that faculties and universities should keep this aspect of needs and today's possibilities in mind when creating their rules for better quality of the teaching process and stimulation of new editions in the field of education.

The conditions imposed by the preventive measures against pandemic risks COVID19, the possibilities of the existing digital technology, the EU directive of open science, open

education, and digitalization, should motivate serious consideration of this document and its further improvements.

Appendix 1

Why should the HEIs's Committees for Quality Assurance and Quality Improvements pay attention to this document?

YouTube, Twitter, Facebook, Tik-Tok, and LinkedIn are becoming resources of informal education. The consequences of such education can sometimes be very problematic. Short, entertaining, and convincing video clips without an appropriate level of scientific approach, today creates the most incredible "conspiracy theories", starting from the "fact" that the Earth may be a flat plate, to the theory that the vaccination process is related to Bill Gates' intention to reduce population on Earth.

The role of the Internet to offer quick access to information is in conflict with the risk that the Internet is also an unreliable source of information. We need open educational resources with a good reputation and strategic partnership among a lot of HEIs in that sense.

The average person does not distinguish the official Internet pages of a public person from the so-called fan pages, so not even from Internet trolls.

In addition, it is questionable whether we can really expect the average person to independently select quality educational YouTube content? If we can conclude that the average person does not distinguish the official Internet pages of a public person from the so-called fan pages, not even from Internet trolls, then the HEIs themselves should keep in mind the need to regulate Internet publishing.

Our answers are affirmative to the questions: Are multimedia contents useful for achieving faster and more lasting knowledge outcomes? Should the teaching process be enriched with such contents? However, it is not the same to use these contents in teaching and advise students to search for them on YouTube themselves. In order for someone to assess whether a YouTube video is credible, the user must know in advance the content they are processing or know that the author/source is professional and reliable.

Keep in mind that a YouTube clip can be recorded by anyone and anyone can tell whatever they want. In general, no one controls the truthfulness and quality of the content. In that way, we get anti-vaxxers and other conspiracy theorists.

We need repositories of open educational content that are trusted, and that can follow the existing needs of both non-formal education and possible applications in formal education. Short forms of open educational resources that can be published on Facebook or/and Twitter, or be elements of intelligent tutoring systems, are also very important.

Therefore, digital publishing of open educational resources should be regulated by quality assurance mechanisms and standards in the same or similar way that is applied in the process of approval and publication of university textbooks.

We hope that the Committees for Quality Assurance and Quality Improvements of Accredited Higher Education Institutions will pay attention to this issue, that this document will be useful for them to improve their own quality assurance mechanisms and standards, and that they will give us useful suggestions for improving this document.

THE AUTHORS

Milan S. Matijević, University of Kragujevac, Kragujevac, Serbia, matijevic@kg.ac.rs

Luis de la Torre Cubillo, National University of Distance Education - UNED, Madrid, Spain, ldelatorre@dia.uned.es

Đorđe Seničić, Cognipix, Beograd, Serbia, djordje@cognipix.com

Maja Milojević Rakić, University of Belgrade, Serbia, maja@ffh.bg.ac.rs

Marko Tanasković, Singidunum University, Belgrade, Serbia, mtanaskovic@singidunum.ac.rs

Gholamreza Anbarjafari, University of Tartu, Tartu, Estonia, shb@icv.tuit.ut.ee

February 2023,

In Kragujevac, Belgrade, Madrid, Tartu