X5GON LIBRARY DOCUMENTATION

The purpose of this documentation is to inform the potential member of the X5GON Community and provider of OER material about the X5GON user activity tracking library – what it does, how to include it into an OER repository and what data it will return to the X5GON Platform.

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DEFINING THE PROBLEM OF OER ACCESS GLOBALLY

Currently, large scale technological solutions for OER and in particular content recommender systems for OER are practically non-existent. There is no off-the-shelf product that OER providers can use to increase the use and re-use of their content and this leads into fragmentation and diminished impact of the OER industry. The result is lesser chances of OER mainstreaming globally.

Helping campus-based and online students and faculty find the right video, open textbook or resource is the cornerstone of a quality OER content distributor. With so many items to reference, it becomes a mammoth task ensuring which is the most relevant and keeping those suggestions up-to-date.

Recommendations as a service are the best way to guarantee proper interconnectedness across your internal and native but also external OER catalogues, improving both usage and conversions. To give an industrial comparison, the reality is that premium players like Amazon, Netflix and Spotify thrive because their users receive the right recommendations to keep them enjoying the service.

We aim to let OER content platforms benefit from this advantage by using X5GON's tech to highlight the best of your content to learners across your site and other OER sites.

THE X5GON SOLUTION IN A NUTSHELL

Project X5GON aims to interact Open Educational Resources from different websites, repositories, LMS and CMS systems. It aims to deal computationally with OER. In X5GON we will index the OER resources and, whenever possible, enrich them, for example in the case of videos, we will create and provide transcriptions and translations. However, in order to gather the different resources, we need them to be made technically accessible and therefore visible.

The way we technically aim to do this is by asking you to add 2 lines of code (the **snippet**) to each webpage containing a resource you want to see indexed. These lines will themselves access a **library**. The library is also **called** in the resource.

The effect of these two lines of code is the following:

1. The X5GON server is warned that the resource "**A"** is being accessed by a user identified by a simple identifier.
2. A list of relevant recommendations is sent to your OER server, which you are free to use as you wish
3. At a later stage, if resource "**A**" was not yet known to the X5GON server, the same resource "**A**" is fetched by a crawler, analysed, treated (with transcription/translation when needed) and indexed. It will in the future be linked to other resources and appear as recommendation for users anywhere in the world.

For this to be possible you - as partner OER site - should:

1. Install some well identified code **on each** Open Educational Resource referring page you wish to share. Remember that only licensed material will be indexed (we suggest using a creative-commons license and can help you with this choice).

2. Make the library accessible either by hosting it on your server or by linking to the library on our server (please note that the snippet should point to this library).
3. Allow the code to execute.
4. Decide how you want to use the recommendations which will be sent to you.

By introducing the snippet, the value that the X5GON solution will provide to OER repositories is the following:

- Gaining the access to other OER and content by offering cross-recommendation;
- Getting additional visitors from other OER and connected sites;
- Supporting learners with learning analytics and learning personalisation features;
- Supporting cross-linguality and access to the relevant content that is not available in learners' native language;
- Transparent access to analytical methods for understanding learning outcomes, and the associated insights;
- Providing content translation thus promoting OER content to other language areas and providing translated content to learners at the site;
- Being connected to a growing OER network with millions of users;
- Institutions need technologies to help them structure and exploit the breadth, depth, and wealth of OER content.

THE X5GON LIBRARY

As we aim to be completely transparent we hereinafter describe what the X5GON snippet and library are, what they do and what data is sent to the X5GON platform. All of the source code is publicly available. Links to the sources are found in section 4.

1 HOW DOES THE LIBRARY WORK?

The X5GON library allows us to acquire activity data of users that visit your repository: the **snippet** sends data to the X5GON platform using the functions from the **library**. The snippet activates when the user accesses the webpage containing the link to the material. The data sent to the platform is described in section 2.

We use cookies to differentiate users. For this, two versions of the library have been developed which differ in how the cookie containing the user identification token is initialized. This was done to give you control of what data is sent to the X5GON platform and to ensure you know exactly what the snippet does. Both versions are explained below.

1. **Cookie creation upon library retrieval – this is the preferred option and gives more value to the OER site.** With this approach the cookie containing the user identification token is created when the browser retrieves the X5GON library. With this we avoid redirection from the OER repository – thus not changing the user experience. Additionally, because the library is retrieved from the X5GON platform all updates that were done to the library can be automatically retrieved. If you would not like to retrieve the latest version of the library, you can specify which version you wish to use by specifying the chosen version.
2. **Cookie creation via redirection.** This version of the snippet is used if the OER provider wishes to have the library locally on their machine. Because of

the nature of the approach the library will make a **quick** redirection (lasting about 10ms) in which we create the identification cookie for the user. The redirection **happens only once**– when the user first accesses the OER repository. Because the library is locally on your machine you will also update/replace the library with a newer version when needed.

With this you will have full control of which library you wish to include in your portal.

2 WHAT DATA DOES THE SNIPPET SEND TO THE X5GON PLATFORM?

When some user visits an OER material found on your repository the snippet will activate itself and send user activity data to the X5GON platform which is located at http://platform.x5gon.org.

User activity data is data which essentially informs the platform which user accessed what material. It contains the following values:

- **userId:** This attribute identifies which user is accessing the OER material. It will be created on the X5GON Platform; the id is going to be of the following format: **randomNumberXtimestamp**. A typical example will look like something like this: **41731408528951275X1524236028520**. This id creation method will ensure no one (including us) will be able to identify the user directly. But it will be sufficient for us to save his or her activity data over sessions, which will be used for creating personalized recommendations.
- **materialURL:** This value is the material identifier and the link which the user visited. It will be used to acquire the material and within the recommendation engine and learning analytics. The acquired material will be enriched and the found enrichment metadata will be stored in the X5GON platform database – the material will NOT be stored. Next, when we recommend materials to the user, the URL will be used as the link to direct the user to the material of interest.
- **referrerURL:** This URL is the link from which the user arrived to the material. It will be used to analyse user learning patterns and to recommend them to other users if it turns out they were insightful.
- **accessDate:** The date at which the material accessed. This information helps us to create timelines and determine if users change their interests.
- **userAgents:** This attribute will contain the information about the technology the user used to access the material. Due to the large usage of bots we will use this information to determine and validate which request or access of the material was done by the user and doesn't correspond to a crawling bot – removing noise from the activity data.
- **location:** The IP address of the user – which will be used to acquire the location of the user. The location can be used to adapt to cultural interests which can be geographically influenced. The user IP will NOT be stored in our database while the extracted location will be stored and used in our analysis.

This data will then be stored and used for learning analytics and to build recommendation models which will be used to send you recommendations which you will be able to use.

What about privacy? Are you not going to be sending personal data? How do you know what you are sending? You have full control about what data you are sending: all the code is in the library which you hold or have access to. The goal is to make personalized recommendations and build sequences of resources which can help a learner acquire or strengthen a skill. So quite logically the more information about the user we have to do this, the better it is.

We are only extracting the information described above and will not change this without your consent. Of course a more informative option would be to let X5GON have some demographic information about the user (which you have if the learner is registered with you). Things like the age, the gender, the studies the user is enrolled in would provide us with richer information which would allow us to send better recommendations but also build a better model. If you are interested with this option, please let us know.

In all cases we are complying with all European regulations, including GDPR.

3 STEP-BY-STEP INSTALLATION ON YOUR PORTAL

Including the X5GON library and snippet to your portal should be straight forward. Please follow the described steps:

1. Register and download the different items of code you will need, including the token corresponding to your site: http://platform.x5gon.org/form.

2. Download the library to your server or choose to let us handle this. An alternative is that you trust us and let us provide the library from the X5GON platform. The library will be made accessible to you at any moment. This will allow us to make technical/security updates. In this case, you can use the snippet as it is. But if you prefer to have the library on your machine, the library should be included in the public folder accessible to every OER that includes the snippet.

3. Identify the OER which you want us to index, and the actual webpages which refer to these OER, i.e. where a link can be found allowing to download or view the resources.

4. On each of these referring webpages include the library call **into the head** of the webpage. This will initialize the library and prepare it to send data to the X5GON platform.

5. Also include the jQuery library enabler if your portal/LMS doesn't already include it. Without this prerequisite the snippet will not work properly and would return invalid values which cannot be used in giving recommendations to the user.

6. Add the snippet which activates the library and send the user activity data to the X5GON platform. This snippet is best added **at the end** of your webpage.

An example of how the library call and snippet are best added is shown in figure 1. In the snippet you will need to replace the string **x5gonPartnerToken** with the token that will be unique for you. This will serve as an id for your repository. This token is generated for you when you register.

How easy is it going to be to include the snippet and the code? We have found that each OER repository has a specific architecture. So there is always a way to automatically add the snippet on all the pages. But we can help you from X5GON to do this (advice, FAQ, etc).

```html
<!doctype html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Home</title>
    <!-- other metadata, style and script resources -->

    <!-- preriquiste for using the snippet -->
    <script type="text/javascript" src="jquery-3.3.1.min.js"></script>
    <!-- library used to track user activity -->
    <script type="text/javascript" src="http://platform.x5gon.org/api/v1/snippet/latest/x5gon-log.min.js"></script>
  </head>
  <body>
    <h1>Home</h1>
    Content...

    <!-- end of content in body -->
    <script>
      // snippet code for sending user activity data
      $(document).ready(function () {
        // send user activity to X5GON platform
        x5gonActivityTracker('x5gonPartnerToken'); // the 'x5gonPartnerToken' will be changed for each OER partner
      });
    </script>

  </body>
</html>
```

Figure 1: Example of how to include the call of the X5GON library and the snippet inclusion into html

What about the recommendations the platform is going to send you? What should you do with them? *Currently we did not initialize the service that gives recommendations (this is a logical consequence of cold starting*). But once we do there are several possible scenarios which will depend on the pedagogical choices you will make. If you want to include the recommendations, or the *n* best, on your page we will ensure that these reach your server within 100ms: this would allow you to give your learners the recommendations as they are loading the page containing the viewed resource. You may also choose to filter these recommendations in any way you want, or even only to present the recommendations upon request by the learner.

4 RESOURCES

This section contains the links to the resources that are related to the X5GON Library and to the processing of data retrieved by the snippet. Table 1 shows the resource names and links.

Resource Name	Link
X5GON Platform	http://platform.x5gon.org
X5GON Platform Source Code	https://github.com/JozefStefanInstitute/x5gon
X5GON Library Source Code	https://github.com/JozefStefanInstitute/x5gon/tree/master/src/server/platform/public/snippet
jQuery Library	https://jquery.com/

Table 1: X5GON resources