

Dissertation

**GDPR Compliant Development
for the EPUM e-Learning Platform**

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for the EPUM e-Learning Platform**

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Abstract

In this individual diploma thesis, a general introduction to privacy and the issues that arise from it are initially described, as well as various concepts such as privacy of personal data, dangers of privacy and the privacy in e-Learning platforms with users are presented.

Moreover, the EU General Data Protection Regulation (GDPR) is described in depth after research and analysis of the GDPR articles. All the articles related to software systems with user management functionality were explained and analyzed on how they could be mapped to a software system.

Additionally the e-learning platform, namely the EPUM platform that was developed in the context of the thesis is presented. The software engineering methodology is described in full detail explaining and analyzing the requirements specification, the platform design, specifying the architecture used and the selected tools and explaining in detail the platform's implementation, along with the methods applied to the platform in order to make it GDPR compliant.

At the end of the design of the system, an evaluation and its results are presented, which was done by sharing a questionnaire to individuals to collect feedback regarding the GDPR functionality and analyze their results.

Finally, an outline of the conclusions drawn from the study of the subject is given and some suggestions for future work are proposed.

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Chapter 1

Introduction

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1.1 Motivation

It is a fact that in the era we live in, due to the rapid development of technology, people are more dependent on several information systems and electronic devices for their daily tasks as well as having accounts to multiple social networks, websites, platforms and applications providing them with much personal information, having their data stored and processed and actions tracked and recorded. The information collected by such systems is usually user-related and as declared in the GDPR “*any information relating to an identified or identifiable natural person*”¹ personal data such as name, date of birth, telephone number, country of residence, social security number, identity number, marital status, yearly income, etc. Moreover, in this category of information also data about a person’s location, current or previous, can be included. This information might be necessary to some systems but not needed to others.

Systems should be built in such a way to ensure the users personal information security and privacy, as well as ask only for data that are indeed needed for the system functionality. With the introduction of the EU General Data Protection Regulation (GDPR) this need is addressed, and organizations and companies inside or even

¹ As defined in Article 4(1), <https://gdpr.algolia.com/gdpr-article-4>, of the GDPR namely ‘personal data’.

outside² the European Union countries are forced to protect their users' data. The GDPR defines in its 99 articles and 173 recitals several rights and provisions regarding such personal data protection, reflecting this big need.

1.2 Thesis Concept

As already mentioned above, because of the importance of personal and sensitive data protection and the introduction of the GDPR, it would be necessary to enhance any platform with functionalities that would make it as compatible as possible with the GDPR. Since nowadays GDPR is a hot topic to EU society but also to non-EU countries that process data of individuals living in the EU, it would be helpful to figure out what functionalities can be implemented based on what is defined in the regulation regarding data owners' rights and what methods can be used to achieve the regulation provisions from a software development perspective.

The main purpose of my thesis project is to develop an e-Learning Platform featuring an innovative teaching methodology, namely the Collaborative Learning Activities functionality, to elaborate a functionality guide towards GDPR compliance of such systems, and to apply such functionality in the e-learning platform in order to ensure that it is privacy preserving and complying with the GDPR.

1.3 Methodology

In order to achieve the above described purposes, I have first conducted a research in past related work regarding privacy and security, user management platforms, content management systems and regulations for the data subject's rights within GDPR.

Subsequently, I studied the GDPR and analyzed all the articles distinguishing which are related to software development and which are not. Afterwards, I studied the requirements of the EPUM Project Platform, which mainly included User Management

² Companies and organizations outside the EU need to comply with the GDPR if their goods or services are offered to data subjects who are in the EU.

functionality, and an innovative learning approach functionality namely the Collaborative Learning Activities (CLA).

The requirements of the platform were collected based mainly on user feedback, and enhanced with GDPR-based requirements extracted from my previous analysis. The platform and its architecture were then designed, and the tools to be used were decided.

For the development of the platform WordPress Content Management Systems (CMS) was chosen, due to its user-friendly interface, the various available plugins and of course its popularity. Then a research was conducted for available and suitable WordPress plugins that could be incorporated in the platform, offering some of the functionality described by the requirements, and additionally for plugins that would help ensure the platform's compatibility to GDPR based on the GDPR requirements. The above research can be found also in [11].

During the implementation step, I developed the Collaborative Learning Activities (CLA) in the EPUM Platform, which is the biggest and most important functionality. CLA is a role based innovating teaching methodology. The "Ultimate Member" plugin was used for the User Management functionality, while the CLA functionality was implemented from scratch using web technologies such as PHP, JavaScript, MySQL, HTML and CSS. Subsequently, I checked which GDPR articles were at this point integrated in the platform in order to decide which articles I would need to incorporate in the platform in order to make it GDPR compatible. I decided to apply data anonymization throughout the platform for embodying article 17 "right to erasure (right to be forgotten)", extending this to the CLAs functionality. Also, I developed the restrict/unrestrict account functionality, for article 18 "right to restriction of processing", and a function to automate the personal data extraction of each user, for article 20 "right to data portability". Afterwards, I developed the data processing policy of the platform according to the GDPR guidelines.

For the evaluation of both GDPR parts of the platform and the CLA functionality, I developed a questionnaire to be filled-in by users of the architecture department of our university and of other universities collaborating with UCY as project partners. In the

context of my thesis, only the GDPR part was evaluated, by a number of users, while the remaining parts of the questionnaire will be used in future research. The analysis of their replies is presented. Nevertheless, testing was done in several steps of the implementation, receiving feedback from the users. Lastly, I developed a user manual guide in order to be distributed to the users of the platform for their help.

1.4 Structure

In the next chapter various concepts of the related work that I have studied, such as privacy, personal and sensitive data and several dangers of user's privacy are presented.

In Chapter 3, the EU General Data Protection Regulation (GDPR) is presented, with all the Articles related to software systems with user management functionality explained and analyzed.

In Chapter 4, the software engineering methodology is presented in full detail. Firstly the requirements specification and analysis is introduced, following the platform design specifying the architecture used and the selected tools. Additionally, the platform's implementation is presented. Finally, I explain about the platform's functionalities that were implemented in order to achieve GDPR compliance after constructing a research on WordPress plugins that could provide GDPR compliance.

In Chapter 5, I describe how after the implementation of the system, questionnaires were created based on some demographic questions, GDPR-based questions, questions on the CLA functionality and questions using the System Usability Scale (SUS) comprising of 7 sections and a total of 59 questions. I also discuss their results collection and analysis extracting some information to evaluate the platform. In this chapter various graphs and comparisons of the results are presented.

Finally, in Chapter 6 we give an insight into the analysis of the conclusions from the study of the subject and the implementation of the EPUM Platform and at the same time suggest some suggestions for future work.

A part of this thesis was published in [11].

Chapter 2

Background and Related Work

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2.1 Privacy of Personal Data

Privacy is a fundamental human right, which was proclaimed by the United Nations General Assembly on 10 December 1948 in Paris with Article 12 [12] and afterwards was introduced by the European Convention on Human Rights on 4 November 1950 in Rome with Article 8 [13]. It is considered one of the most important human rights of the modern age we live in, and many works from different areas of study have been considering and discussing information privacy for many years now.

The need for privacy eventually became increasingly intense, which led to the taxonomy proposed by Solove divisions of privacy concerns into four groups consisting of 16 subcategories, which are presented below [8]:

- **Information collection** – how data is acquired, either through “surveillance” where someone is being watched or through “interrogation” where someone is being questioned.
- **Information processing** – what someone does after they have acquired that data. It includes “aggregation” where data is combined, “identification” where data is connected to an individual, “secondary use” where data is used for other

reason instead of what was intended, “exclusion” where data isn’t revealed to the person it was collected from, and “insecurity” where data is leaked.

- **Information dissemination** – activities that release information. It includes “breach of confidentiality” where a privacy promise is broken, “disclosure” where true data is released, “distortion” where false or misleading data is released, “exposure” where nudity or other intimate data is released, “increased accessibility” where the availability of data is strengthened, “blackmail” where the release of data is threatened, and “appropriation” where an identity is stolen.
- **Invasion** – attacks upon private affairs rather than activities regarding data. It includes “intrusion” where personal privacy is violated and “decisional interference” where one’s right to make decisions is impacted.

“Formal methods for privacy” [10] is making a connection between the above taxonomy and technology, and it refers to the terms of data holder and data subject, that are later also defined in the GDPR.

According to [7], privacy is a vital part of our identity and self-presentation so by deciding what information to reveal to the systems we use, is part of deciding who we are. But the question is how to feel safe about entering our data in several systems when it is commonly known by now that information flows freely, it can easily be cached, distributed, forwarded, copied, mirrored and indexed, as discussed in [5].

S.Confer describes in [3] that in the past, citizens expressed their privacy concerns because they wanted to hide from their government certain information about them, but in the era we live in now those concerns have enhanced with those that have to do with corporations concealing online practices from less technologically understanding consumers, due to the Internet Age that allowed greater and faster access to consumer information.

2.2 Dangers of privacy

In the modern and constantly evolving technological era we live in, in a society where everyone has access to a huge volume of data and at the same time each individual can provide huge volume of information, there are many risks that aren’t obvious to everyone. Every day, people use the Internet and multiple technologies for their

entertainment, finding information and communication with others through web applications or mobile applications.

It is known all over the world that over the last couple of years there have been some big data breach incidents. For example, in 2014 hackers attacked Yahoo and compromised the real names, telephone numbers, dates of birth, email addresses, passwords and security questions and answers of 3 billion users. Also, in May 2014 eBay had a cyberattack that exposed names, dates of birth, home addresses and encrypted passwords of all of its 145 million users. Moreover, in April 2011 Sony's PlayStation Network had been attacked and hackers gained access to full names, passwords, e-mail and home addresses, purchase history and credit card numbers. Incidents like those happened to many known companies and organizations through the years. After finding out about these big incidents people are in anxiety about the safety of their personal data.

Additionally, there are applications in the market that are classified under the term of “creepy”, as said in [9]. Creepy activity isn't exactly harmful and doesn't bypass the privacy settings of the device but the purpose of sharing the users' data to other users is disturbing to the data's owner. For example the “Girls around Me” app maps and leaks the location and information about female users that are around the user who has checked in through social network in user's vicinity. The specific app doesn't violate the privacy settings or surface data that weren't already available but still it is “creepy”.

2.3 General Data Protection Regulations (GDPR)

The European Union decided to face this need for protecting personal data, by voting and applying the EU General Data Protection Regulation (GDPR) that was entered into force on May 24, 2016 and it is directly applied in all EU Member States since May 25, 2018. The GDPR enforces all organizations and companies that reside in EU or have EU residents as their users to comply with its regulations. GDPR consists of 99 articles and 173 recitals, such as Lawfulness of processing (Article 6), Conditions for consent (Article 7), Right to rectification (Article 16), Right to erasure (Article 17), Right to

restriction of processing (Article 18), etc. It aims to protect all EU citizens from all stages of data processing³, privacy and data breaches in today's data driven world.

As described in [6], GDPR compliance is a problem for organizations due to the strict constraints that imposes when dealt with personal data. Also, in case of violation of those constraints, it specifies severe consequences to the organizations such as legal and financial penalties. Moreover, several controversies arisen because of the strict definition of consent withdrawal and the Right to be forgotten (Article 17). This controversies are reviewed in [4] in reference to their impact after implementation on privacy and personal data.

Even though there are some works that describes how a software system can be GDPR compliant, there are lacking of specific guidelines as to how clarify and exactly apply the Articles to e-Learning platforms and software engineering.

2.4 Privacy in e-Learning platforms with users

With the increasing availability of Internet technologies and computing, distance learning through e-Learning platforms has started to have the same reputation as traditional learning methods [2]. Due to the popularity that personalization gained in our days, more and more e-Learning platforms try to adapt the information that extract from their users' personal data to create an adaptable and also adaptive system for their users' best experience.

E-learning is a flexible term used to describe the newest method of teaching throughout the online internet technology [1], but due to the dangers of the Internet and the increase of illegal activities must take into consideration that security measures need to be established. Users use a specific system if the feel safe using it and basically trust it.

³ As GDPR defines in Article 4, <https://gdpr.algolia.com/gdpr-article-4>, “processing is any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organization, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction”.

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Privacy and GDPR

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3.1 Introduction

The General Data Protection Regulation (GDPR) is defining an extended set of rights for the European Union residents regarding their personal data information collection, storage, processing and managing.

It has entered into force on May 24, 2016, and it is applied in all EU Member States since May 25, 2018. The GDPR does not only apply to organizations that are established in EU but also to organizations that are not established in EU but process personal data of users that are residents of EU. The purpose of the GDPR is to protect the personal data of each user at all stages of data processing.

The focus of this chapter is on how the GDPR provisions shall apply in software development in order to ensure the system's compliance.

3.2 Principles- Article 5

3.2.1 “Lawfulness, fairness and transparency”

“Lawfulness, fairness and transparency” as defined in the GDPR article 5 paragraph a⁴.

For software development this means that before any processing or storing of personal data, the software must assure that the user's consent has been established. Processing is considered lawful only if the system has a lawful basis under Article 6. Also, the software should keep confirmation record of the consent that states when and how it got the consent from the user and what exactly was the user told at the moment of providing the consent.

For example, in a user management system this means that if the user does not tick the consent check box then the system is disallowed from processing or even storing the users' personal data. The check box should not be pre-ticked and the system must ensure that the processing purpose is presented clearly and separated from any other Terms and Conditions of the system. This way, the user will be able to decide after reading the purpose if he/she wants to provide his/her consent.

Moreover, all the necessary information that the user needs to know about, must be presented in a clear way.

⁴ Article 5 of GDPR, <https://gdpr.algolia.com/gdpr-article-5>

In the same example, this information can be in a separate page that explains them in a simple, understandable by the users' language. That way, all users will be able to know how and for what purpose their data will be processed. So, the software must take applicable measures and be able to provide certain information to the user in order to ensure the fairness and transparency in the use of his/her personal data.

Fairness suggests that what is processed, should be processed in the way it has been described and not in any other way.

3.2.2 “Purpose Limitation”

“Purpose Limitation” as defined by GDPR article 5 paragraph b.

For software development this means that the purpose of the collection of a data subject's data should be explicitly stated to him/her, before he/she provides the system with the specific data.

For example, in a user management system this could be implemented by providing a page called “Data Processing Privacy Policy” that will clearly states the purpose. So the user will be able to read it before he/she give his/her consent, but also at any given time even without an account, and afterwards accepts the privacy policy during registration.

3.2.3 “Data Minimization”

“Data Minimization” as defined by GDPR article 5 paragraph c.

For software development this means that the system should only collect and process the minimum personal data required for the system in order to achieve its processing purposes. The data subject has the option to choose freely if he/she wants to provide extra personal data that are not compulsory.

For example an e-Learning platform, should only request from the user to provide the personal data that are required for the purposes that the user has consent to. The system should not request or obtain more personal data from the user.

3.2.4 “Accuracy”

“Accuracy” as defined by GDPR article 5 paragraph d.

For software development this means that the system should provide to the user the ability to change his/her personal data in order to ensure their accuracy.

In the example of user management system, the user should be able to modify his/her personal data at any given time, in order to provide accurate and up to date data to the system. All previous values must be deleted directly from the system database.

3.2.5 “Integrity and Confidentiality”

“Integrity and Confidentiality” as defined by GDPR article 5 paragraph f.

In Computer Security there are three main principles, CIA triad, namely Confidentiality, Integrity and Availability. So, for software development it means that in the whole system security measures should be applied that include encryption of data, use of secure communication channels, use of firewall and antivirus software, follow established security frameworks, restrict access to data etc. Generally, data have to be processed in a way that minimizes confidentiality and integrity risks. This can be controlled by running risk assessments for the system and applying risk management measures or frameworks.

In the example of an e-Learning platform, each user has the authority to view only his/her own account and therefore data.

3.3 Lawfulness and Consent

3.3.1 Lawfulness of Processing – Article 6

“Lawfulness of Processing” as defined by GDPR article 6.⁵

Above, the six available lawful bases for processing are presented. In software development one of them at least should be applied whenever a system processes personal data. The lawful basis should be determined before the data processing begins and also should be documented in the system. The selected lawful basis as well as the purpose of processing should be presented clearly in the Privacy Policy of the system.

3.3.2 Conditions for Consent – Article 7

“Condition for Consent” as defined in GDPR article 7.⁶

In software development this means that when a user is able to give his/her consent to a system to use his/her personal data must also be able to withdraw that given consent in a simple way.

3.4 Data Subject Rights

3.4.1 Right of Access by the Data Subject – Article 15

“Right of Access by the Data Subject” as defined by GDPR article 15.⁷

In software development the information 1 a, b, e, f and h are not specifically associated with each data subject but general specifications of the system. For example in an e-Learning platform this information, namely purpose of processing, categories of the data which will be processed, right to erasure, rectification and restriction, the receivers

⁵ GDPR article 6, <https://gdpr.algolia.com/gdpr-article-6>

⁶ GDPR article 7, <https://gdpr.algolia.com/gdpr-article-7>

⁷ GDPR article 15, <https://gdpr.algolia.com/gdpr-article-15>

of the data, the period which the data will be processed and the source the data were obtained from, are demonstrated in the “Data Processing Privacy Policy” page.

In case a user wants to receive confirmation whether or not his/her personal data are being processed or wants to have a copy of that data, the system should check if the specific user’s id is associated with an entry on the database tables.

In order for the system to give information about c, d and g, either should save information of the receivers of each user’s data or to send all data to a specific receiver following a specific policy.

3.4.2 Right to Rectification – Article 16

“Right to Rectification” as defined by GDPR article 16.⁸

In software development in a user management system example, this Article could apply by giving all users the ability to edit their profiles and accounts information at any given time. The system in a case of data changes should immediately replace the values with the new given ones and deletes the previous stored values.

3.4.3 Right to Erasure (Right to Be Forgotten) – Article 17

“Right to Erasure (Right to Be Forgotten)” as defined by GDPR article 17.⁹

This Article in software development gives the same result to the deletion request of every case from a to f.

In the example of an e-Learning platform, if a user request’s to delete his/her account then the personal data of the specific account should automatically be deleted and no association with the specific user should be held in the database. In the case the resources that a user has created should not be deleted after the deletion of his/her

⁸ GDPR article 16, <https://gdpr.algolia.com/gdpr-article-16>

⁹ GDPR article 17, <https://gdpr.algolia.com/gdpr-article-17>

account, due to the nature of the e-Learning platform and because other users are members to them and have access on them, then every detail that had relation to his/her account should be anonymized.

3.4.4 Right to Restriction of Processing – Article 18

“Right to Restriction of Processing” as defined by GDPR article 18.¹⁰

For software development the reason between a, b or d does not change the result for the software: the data subject request of the system to restrict the processing on their personal data but not to delete them.

In a user management system example this Article can be applied by giving the user the ability to request to restrict the processing of his/her personal data. Upon a restriction request the system should make the personal data temporarily unavailable for use, stop processing them in any way, but keep them stored. If the user decides to unrestrict their data, then he/she will be able to do so.

3.4.5 Right to Data Portability – Article 20

“Right to Data Portability” as defined by GDPR article 20.¹¹

In a user management platform example some functionality could be integrated (automated or not) in order to provide the user the ability to export his/her personal data on his/her own at any given time. The system should do the appropriate validation checks to confirm that the user asking for that copy is the actual data subject associated with those data.

¹⁰ GDPR article 18, <https://gdpr.algolia.com/gdpr-article-18>

¹¹ GDPR article 20, <https://gdpr.algolia.com/gdpr-article-20>

3.5 Data Protection by Design and by Default – Article 25

“Data Protection by Design and by Default” as defined by GDPR article 25.¹²

For software development this Article means that the system should be developed with compliance to GDPR as the main requirement in the whole development process, in all stages of design and implementation phase.

GDPR states that organizations, by default, must process personal data for the purpose it was collected, and never for other purposes.

In terms of privacy by design at the earliest stages of development, the regulation encourages some techniques one being pseudonymization of personal information. This refers to processing personal information so that it cannot be associated back its owners without additional information.

¹² GDPR article 25, <https://gdpr.algolia.com/gdpr-article-25>

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4.1 Introduction

In the context of this thesis, the EPUM platform was designed and implemented. The EPUM Platform is a web platform for open e-Learning, aimed to host and provide an innovative teaching methodology, the Collaborative Learning Activities (CLA), a blended learning approach in the teaching of urban morphology. The platform includes functionality open to all users, such as case studies and news blog, as well as additional functionalities that require the registration of the users and login to their accounts in order to have access to them. Having user registration, it is required to have a user management mechanism in order to create user accounts and profiles, store and process their personal information, authenticate them and authorize their access, and allow them to use the CLA functionality.

As previously explained, privacy protection of personal data in information systems is not only critical but due to the new General Data Protection Regulation mandatory to implement in any system.

As well as many other systems, e-Learning platforms store and process personal information of their registered users as well. As a category of user-management systems, e-Learning platforms need to be designed and developed in a way that will make them compatible to the new data protection regulation.

However, it is not fully clear yet how the GDPR articles can be accurately integrated in software systems. At this point of my thesis project, I examine the application of my previous GDPR analysis for the design and the development of an e-Learning platform, the EPUM Platform, in order to achieve the platform's compatibility with the GDPR.

4.2 Platform Requirements

The basic functionality of the platform was described during the proposal stage of the project in the specific document. Hence, during the specifications stage, the requirements of the platform were first extracted from the first document and afterwards, a questionnaire was prepared and distributed to the partners, which are the future users of the platform, in order to define a complete set of project-based requirements. The results of the questionnaires were analyzed to prepare the System Requirements Specification Document (SRS). In the context of this thesis the requirements were taken as a ready input. Eventually the platform's requirements were enhanced with GDPR-based required functionality, extracted from the research that I did based on the GDPR articles and from the Privacy Policy needs of the platform.

	Specification	Type
(1)	User Registration	Project Requirement
(2)	User Login	Project Requirement
(3)	Password Reset	Project Requirement
(4)	Display Static Information	Project Requirement
(5)	Forum	Project Requirement

(6)	Display Calendar	Project Requirement
(7)	Search for Posts	Project Requirement
(8)	View User Profile	Project Requirement
(9)	Collaborative Learning Activities	Project Requirement
(10)	Display Privacy Policy	Lawfulness of Processing
(11)	Edit User Account Data	Right to Rectification
(12)	Edit User Profile	Right to Rectification
(13)	Access own personal data	Right to Access
(14)	Export personal data	Right to Portability
(15)	Restrict/Unrestrict User Account	Right to Restriction of Processing
(16)	Delete User Account	Right of Erasure

Table 4.2.1. EPUM Platform Specifications

The software requirements are presented in Table 4.2.1 and the type of the requirements are based on (A) the project requirements as determined by the application document and the analysis of the results of the questionnaire (rows 1-9), and (B) the requirements added due to the need of GDPR compliance and the Privacy Policy (rows 10-16). Regarding the GDPR requirements, on the second column of the table (“Type”), the principles found in the GDPR are presented, while at the first column (“Specification”) the respective requirements of the platform are presented. Each requirement is mapped to the specific functionality implied by the provision, as discussed in Chapter 3.

4.3 Platform Design

4.3.1 Architecture

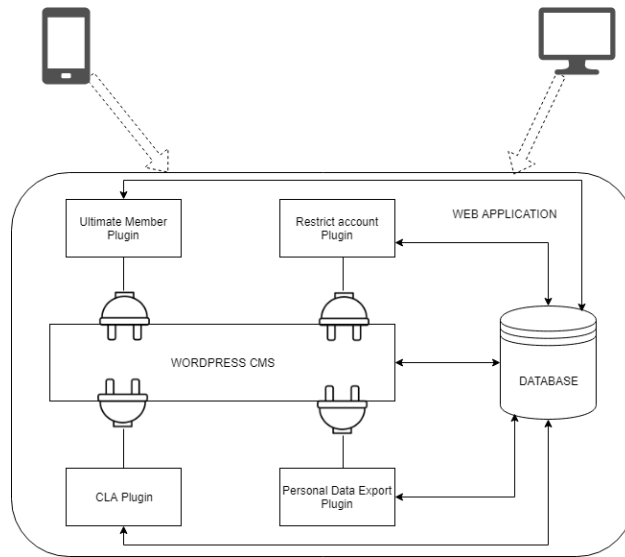


Figure 4.3.1.1. System Architecture

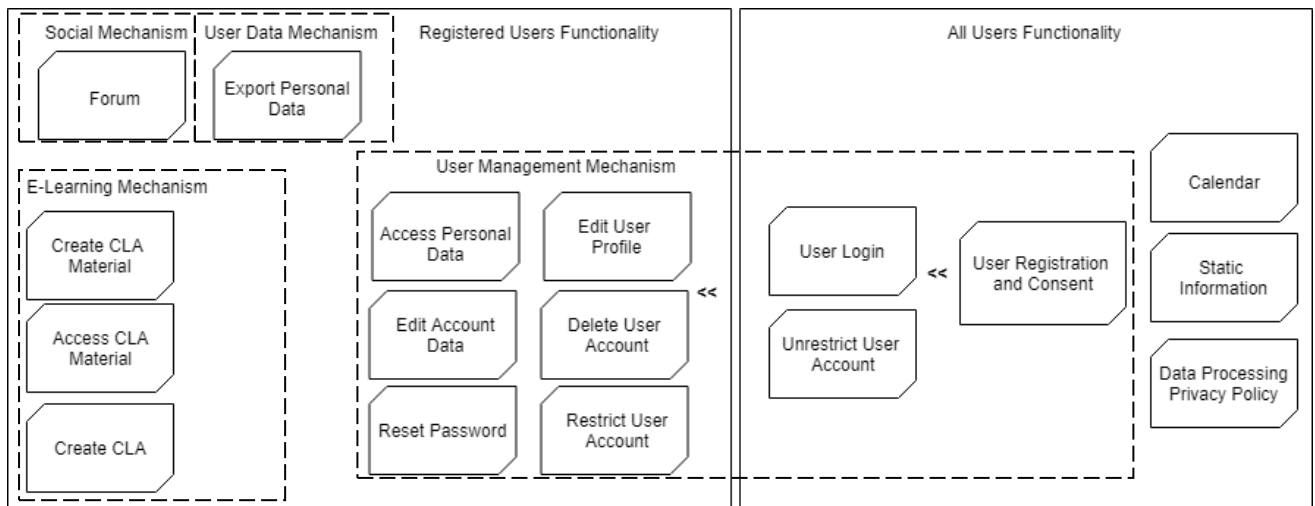


Figure 4.3.1.2. EPUM Platform Architecture

In Figure 4.3.1.1 the architecture of the system is presented. The clients are connected with the system of the web application. The WordPress Content Management System is enhanced with several plugins such as the “Ultimate Member” plugin that is responsible for the user management functionalities and some GDPR- related functionalities and some plugins that were implemented by me to integrate more functionalities of GDPR in the system and develop the main functionality which is the CLA functionality.

The diagram in Figure 4.3.1.2 presents all the functionality of the platform that is available to all the users, either visitors (the users that aren’t logged in) or registered users (the logged in users), and to registered users only. For all types of users, basic web platform features, such as the Data Processing Privacy Policy and several Static

Information relating to the project, are integrated and accessible without constraints. Furthermore, a Calendar functionality that is part of the new teaching methodology, the CLAs, was decided to be of open access. Additionally, in order for the architecture to be able to maintain and manage the user accounts of the registered users, it was essential for a User Management System to be embedded. The User Management mechanism is responsible also for the following GDPR related functionalities: Editing of User Profile, Editing of Account Data, Deletion of User Account, Restriction of User Account, Unrestriction of User Account, Access of Personal Data and Consent (or Confirmation) along with User Registration form. Moreover, the Data Processing Privacy Policy is presented as a separate module, User Data Mechanism, which can be easily accessed by any users, being essential. Similarly, the Export Personal Data is presented as a distinct functionality, related to the GDPR, as it extracts information related to the user from the whole e-learning platform, including materials of the CLAs and profile information. This functionality is directly related to the Access of Personal Data functionality provided as part of the user management system, giving access only to account and profile information.

4.3.2 Data Flow Diagrams

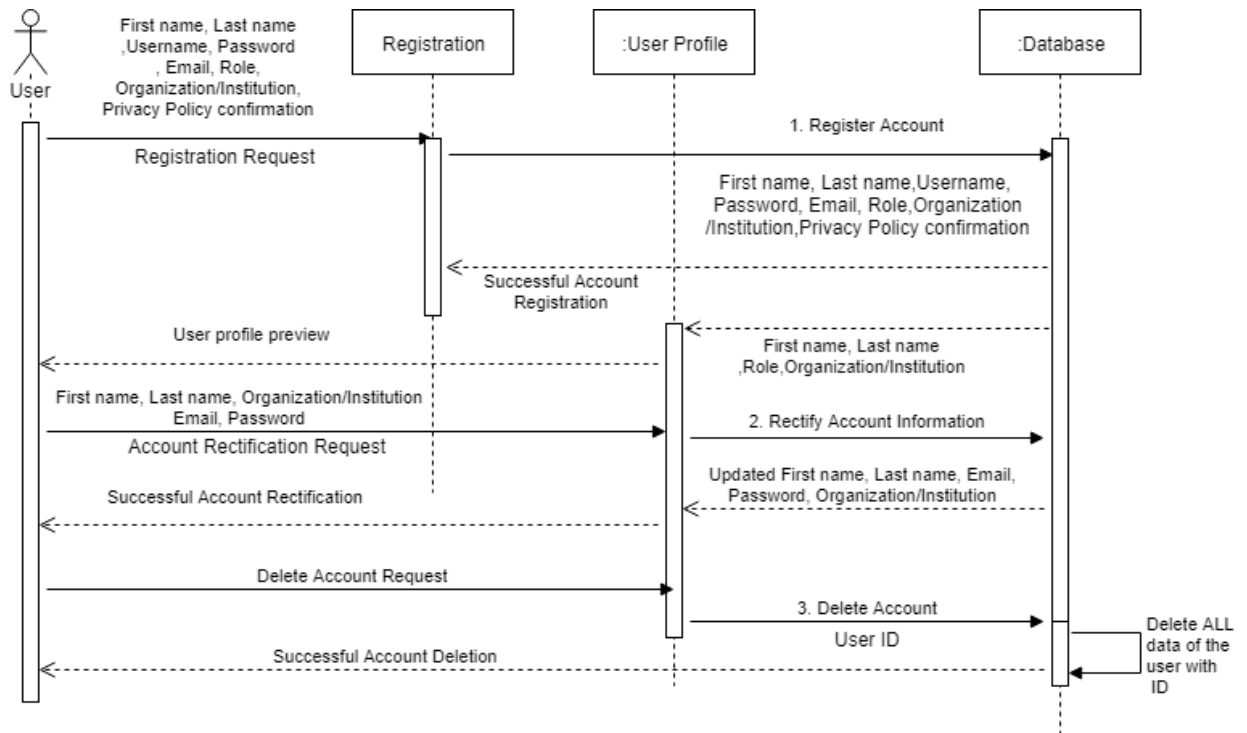


Figure 4.3.2.1. EPUM Platform Sequence Diagram: GDPR-compliant Register, Rectify and Delete

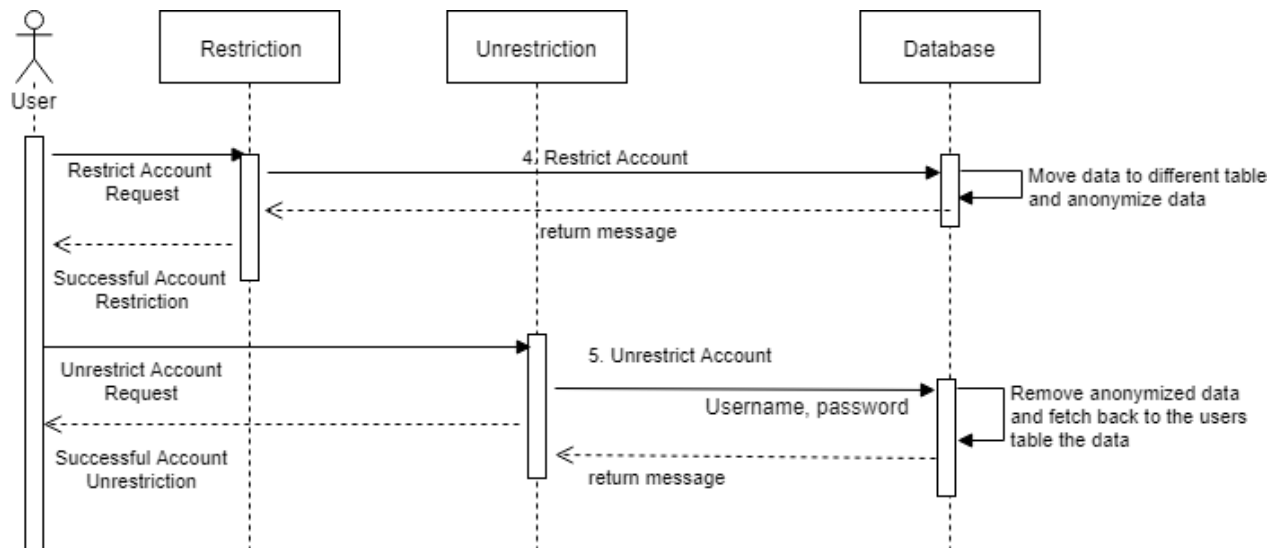


Figure 4.3.2.2. EPUM Platform Sequence Diagram: GDPR-compliant Restriction and Unrestriction

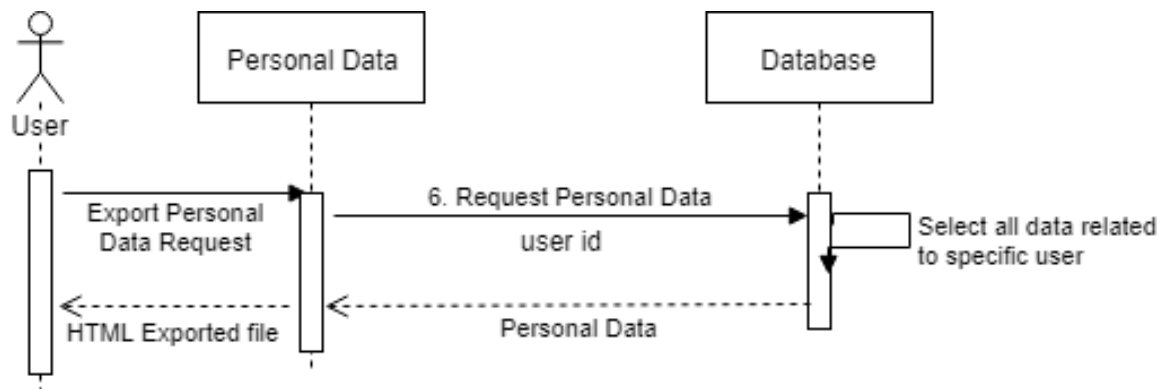


Figure 4.3.2.3. EPUM Platform Sequence Diagram: GDPR-compliant Personal Data Export

The sequence diagrams, Figure 4.3.2.1, 4.3.2.2 and 4.3.2.3 are used to present the flow of the user's personal data towards the platform data management functionality and the database, concerning the already discussed GDPR provisions. The User Profile entity represents the set of pages in the platform that are related to user information input, access or update. The above figures presents the data flow regarding Lawfulness of Processing, Data Minimization, Right to Rectification, Right to Erasure, Right to Restriction of Processing, Right to Access and Right to Portability.

In Figure 4.3.2.1, the data flow is initiated by the user sending a set of data, namely first and last name, username, password, email, role, organization/institution and privacy policy confirmation, towards the system. Originally, the data flow related to user registration is presented, where the user entity sends to the Registration entity the minimum amount of data required, that in the EPUM's platform case refers to all the requested data due to the fact that are all mandatory for an account creation. Also, his/her confirmation for acceptance of the privacy policy of the platform towards processing storing his/her personal data is sent from the User entity. The data flow then proceeds towards the Database, where the data will be stored, which in return sends an acknowledgement of successful registration to the Registration entity and the set of the user's profile data (first and last name, role and organization/institution) to the User Profile entity where the user can preview his/her profile. Additionally, the data flow related to the user profile edit functionality is presented. The user sends his/her new personal data directly to the User Profile entity, which transmits them to the Database to do the related update queries. After the update of the data, a flow from the Database to the User Profile entity and from the User Profile to the User verifies the data rectification and presents the updated data to the user. The last data flow in this figure, presents the case where the User sends a delete account request to the User Profile entity, which forwards that request to the Database. Onwards, the Database applies anonymization to the user's data and deletes all relations that can be used to identify the specific user. The Database, after the completion of the request sends acknowledgement directly to the User, due to the fact that he/she no longer has an account.

In Figure 4.3.2.2, the data flow presents the case where the User sends a restrict account request to Restriction entity, which transmits the request to the Database. As the user is logged in there is no need to send specific data to the database, specific queries are executed to identify the user. Onwards, the Database moves the specific user's record to another unused table that is specified for the restriction function. Then, the Database sends an acknowledgement back to the User. Moreover, in this figure, the data flow of the case of user unrestriction request is presented. The User sends the unrestriction request, with his/her username and password to the Unrestriction entity, which then forwards them to the Database. The Database moves the data of the specific user from

the restriction table back to the users table, linking the record again with the specific user. Afterwards, the Database sends acknowledgement to the User for the account's unrestriction.

In Figure 4.3.2.3, the data flow related to exporting personal data of a user is displayed. The User sends his/her request to the Personal Data entity, which sends the request with the user's id to the Database. The Database collects and fetches the appropriate information of the specific user and forwards them to the Personal Data entity. The Personal Data entity in return constructs the HTML file that contains the fetched data in order to be exported and forwards it to the User.

4.3.3 Selected Tools

4.3.3.1 WordPress Content Management System

For the development of the EPUM e-Learning Platform, the WordPress Content Management System (CMS) was selected. The specific CMS was selected because is free, secure and putting efforts towards GDPR compliance¹³, responsive and highly customizable through the multiple themes it provides, provides a huge set of plugins to choose from and, most importantly, is open source. WordPress being an open source CMS means its building code is free and can be accessed by all users to add more functionality by creating own coded plugins or by customizing its own code. According to W3Techs¹⁴, WordPress is used by 33.9% of all websites, nowadays.

4.3.3.2 Hyper Text Markup Language – HTML

HTML is the language used to describe the structure of Web pages and Web applications. HTML is not a programming language, is just a mean to structure pages using markup. It was developed by the Word Wide Web Consortium (W3C) and Web Hypertext Application Technology Working Group (WHATWG) and released in 1993.

¹³ <https://wordpress.org/news/2018/05/wordpress-4-9-6-privacy-and-maintenance-release/>

¹⁴ <https://w3techs.com/technologies/details/cm-wordpress/all/all>

The purpose of HTML is to provide a set of general rules on how should the content look when it's rendered.

In the EPUM e-Learning Platform, HTML was used to set up the static functionality, the structure and the core graphical user interface of the platform.

4.3.3.3 Cascading Styling Sheet – CSS

CSS is the language used to describe the presentation of Web pages and Web applications. It is designed to enhance the capabilities of HTML, permit the separation of presentation and content in order to improve content accessibility and provide more flexibility and control in the specification of the presentation's characteristics. It was developed by W3C, Bert Bos and Håkon Wium Lie and released in 1996.

In the platform, CSS was used to enhance the user interface presentation.

4.3.3.4 PHP: Hypertext Preprocessor – PHP

PHP is a general-purpose programming language designed for web development. PHP is used to develop both static and dynamic websites as well as web applications. It was developed by the PHP Development Team and Zend Technologies and released in 1995. Originally, PHP stood for Personal Home Pages.

In the EPUM e-Learning platform, PHP was used as the basic programming language to implement all the functionality (except functionality that was integrated through plugins), to connect the platform with the server and the database in order to implement the core functionalities.

4.3.3.5 MySQL

MySQL is an open-source relational database management system (RDBMS). MySQL provides access to multiple users in a set of database data. It was developed by Oracle Corporation and released in 1995. MySQL name derives from “My”, which was the

name of the co-founder Michael Widenius's daughter, and "Structured Query Language". It is under the terms of the GNU General Public License.

In the EPUM e-Learning platform, MySQL was used to store the data of the user and basically, every information that is used in the system and needs to be stored. Also, it was used to fetch data and present them to the user and also update or delete existing data.

4.3.3.6 JavaScript (JS)

JavaScript is a high level interpreted programming language that conforms to the ECMAScript specification. Is a prototype-based, dynamic language that supports object-oriented, imperative, and declarative styles. JavaScript enables interactive web pages and is a crucial part of web applications. It was developed by Netscape Communications Corporation, Mozilla Foundation and Ecma International and released in 1995.

In the EPUM e-Learning platform, JavaScript was used to make html elements visible or hidden, such as forms and edit forms. JavaScript was also used in the CLA User Management functionality.

4.3.4 State-of-the Art Plugins Research

In order to identify available plugins implementing the required specifications drafted in the previous phase (Platform requirements) into WordPress based platforms a study of the existing state of the art was conducted. Table 4.3.4.1. shows a few rows of the above mentioned research results: in the first column the associated project requirement or GDPR associated functionality is noted, in the second column details such as technologies, functions, or code parts used to achieve the specific functionality and in the third column plugins identified as appropriate to cover that requirement are listed. Furthermore, during the research, the plugins' code were examined to locate the points where the specific functionality is executed, as well as data offered from the WordPress Plugins Directory, such as the date of the last update, the number of installations, the

versions of WordPress that the plugin is compatible with and lastly the plugins reviews. All mentioned parameters were taken into consideration when deciding the plugins to use on EPUM platform. The whole table is presented in Appendix A.

GDPR	Details	Plugins
Right to Data Portability	<ol style="list-style-type: none"> 1. Plugin function file_export_data(\$email, \$format, \$key) generate_export(\$email, \$format) 2. dataExportRequest.php file 3. Export ZIP file with user's personal data, using data gathered by WordPress and participating plugins for site owners.(Side menu ->Tools -> Export Personal Data) 4. Users can download their private message chat history (Updated premium Private Messaging extension) 	<ol style="list-style-type: none"> 1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description) 2. WooCommerce GDPR (DSGVO) Data Protection-By codemenschen (https://wordpress.org/plugins/wp-gdpr-data-protection/) 3. Wordpress updated version 4. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)
Right to erasure/Right to be Forgotten	<ol style="list-style-type: none"> 1. Anonymizing user data, plugin file-DeleteRequest.php, plugin function anonymiseRequests() 2. Plugin function <ul style="list-style-type: none"> • Users can remove themselves from the site with a request form (php function 	<ol style="list-style-type: none"> 1. WP GDPR Compliance-By Van Ons (https://wordpress.org/plugins/wp-gdpr-compliance/) 2. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description) 3. Wordpress updated version 4. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-

	<p>gdpr_request_form('delete')/ shortcode [gdpr_request_form type="delete"]).</p> <p>After form submission, the user receives confirmation email. On confirmation, user data gets analyzed to check if there is any published content on the site (post or comment). (A) If there isn't, user will be deleted from the site and get confirmation emails. (B) Otherwise, he will be added to a review table on dashboard. (Side menu GDPR->Requests->Erasure tab) On this table, can review all user's content and choose to reassign the content to an admin or anonymize their comments. Anonymizing comments will</p>	<p>member/</p>
--	---	--------------------------------

	<p>remove their name, picture and IP address from the comment but comment message will remain. Then click on “delete” button and the specific user will be removed from the site.</p> <ul style="list-style-type: none"> • delete_user(\$user, \$index) <p>3. Erase user’s personal data, including data controller by participating plugins for site owners. Email-based method to confirm personal data erasure request (for registered users and commenters) (Side menu -> Tools ->Erase Personal Data)</p> <p>4. Plugin feature</p> <ul style="list-style-type: none"> • Delete/unsubscribe users from your MailChimp list when they delete their account(premium MailChimp extension) • Enable user deletion 	
--	---	--

	tab so users can delete their account (account page)	
--	---	--

Table 4.3.4.1. State-of-the art

4.4 Platform Implementation

As already described, the WordPress CMS was used for the basis of the platform's implementation, on top of which all desirable functionality was built, by the addition of existing plugins and the creation of own coded plugins. The connection between the selected technologies is presented in Figure 4.4.1 the basic WordPress services were used for implementing the "Data Processing Privacy Policy" page and the "Static Information" functionality.

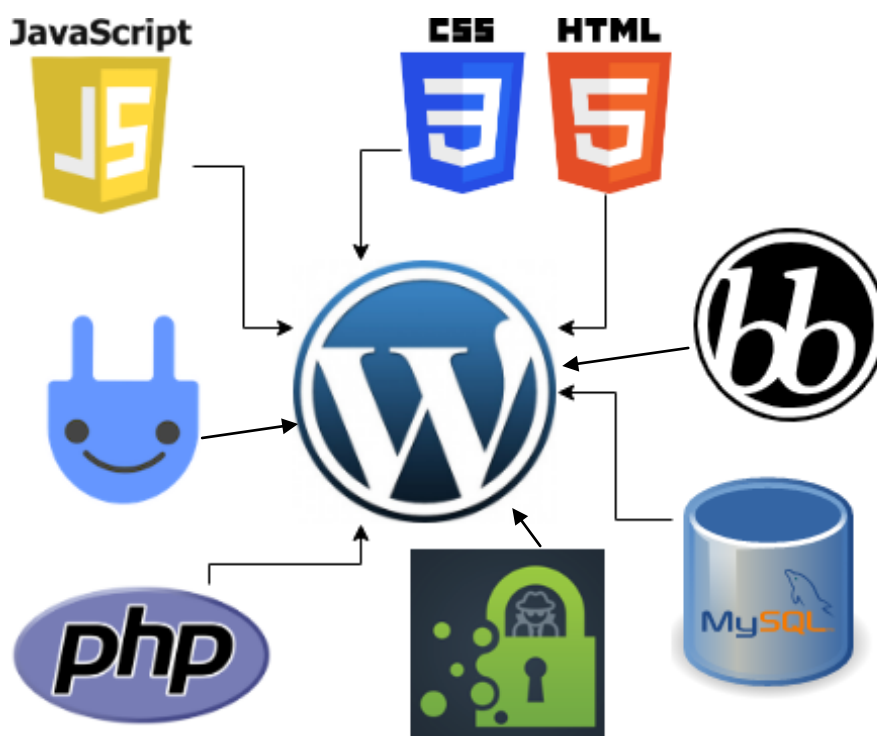


Figure 4.4.1 Technologies and plugins used on WordPress

Moreover, some of the User Management functionality, such as the Access to User's personal data, the Edit of User Profile and Account data and the Delete of User Account functionality were enabled and structured by embedding the "Ultimate Member" plugin to the platform. For the development of the "Restrict/Unrestrict" functionality, the

“Collaborative Learning Activities” functionality and the “Calendar” page own coded plugins were developed using web technologies. Lastly, for the “Forum” page functionality was used the “bbPress” plugin. The above are presented in table 4.4.1.

Specification	Used Plug-in/Technology
(1) User Registration	Ultimate Member
(2) User Login	Ultimate Member
(3) Password Reset	Ultimate Member
(4) Display Static Information	WordPress pages
(5) Forum	bbPress plugin
(6) Display Calendar	Own plug-in
(7) Search for Posts	WordPress
(8) View User Profile	Ultimate Member
(9) Collaborative Learning Activities	Own plug-in
(10) Display Privacy Policy	WordPress pages
(11) Edit User Account Data	Ultimate Member
(12) Edit User Profile	Ultimate Member
(13) Access own personal data	Ultimate Member & Own plug-in
(14) Export personal data	Own plug-in
(15) Restrict/Unrestrict User Account	Own plug-in
(16) Delete User Account/Anonymize	Ultimate Member & Own plug-in

Table 4.4.1. EPUM Used Plug-ins and Technologies

The page or interface layout of EPUM platform includes the following items:

- EPUM LOGO, at the top left of the screen, used to inform user about the platform logo and redirect him/her to home page.
- HOME, at the top center of the screen, used to redirect the user to home page.
- LOGIN, at the top center of the screen on the right of Home, used by Registered and Administrator users to log-in.

- REGISTER, at the top center of the screen on the right of Login, used by non – Registered users to create an account.
- RESOURCES, at the top of the screen next to Register, dropdown list used by users to view case studies, key texts and videos.
- ABOUT EPUM, at the top right of the screen on the left, dropdown list used by users to inform about the EPUM project.
- OTHER, at the top right of the screen, dropdown list used by users to view other materials such as news, glossary and frequently asked questions for both teachers and students.
- CALENDAR, at the top right of the screen, used by users to inform about every event that took or will take place in relation to the CLAs.
- SEARCH, at the right of the screen above Calendar, used to help users find information based on specific search.
- DATA PROCESSING POLICY, at the right of the screen on the left of Search, used by users to read the platform’s privacy policy.
- FACEBOOK & TWITTER, at the top right of the screen, links the user to the appropriate pages.

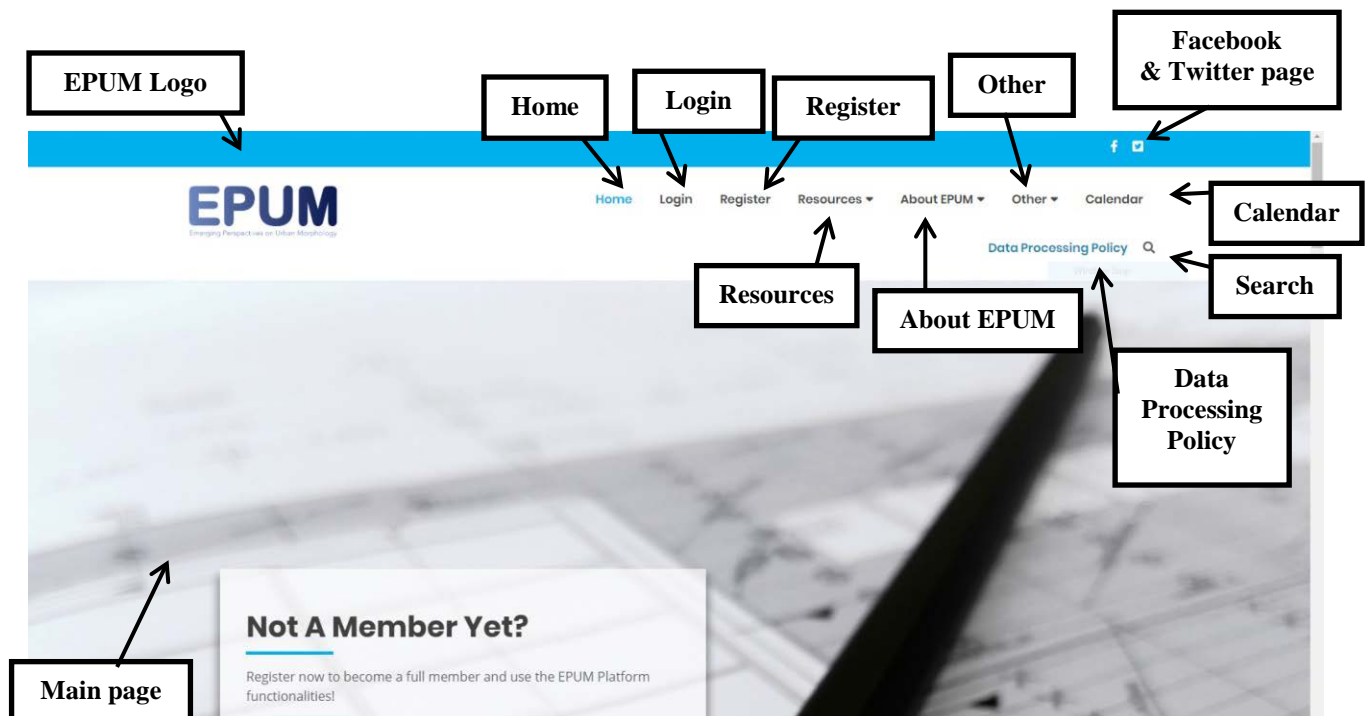


Figure 4.4.2. EPUM Platform Interface Overview

The page or interface layout of EPUM platform for the logged-in users includes the following items:

All the previously explained items keep appearing for the logged-in users as well, except Login and Register.

- COLLABORATIVE ACTIVITIES, at the top center of the screen on the right of Home, the main functionality of the platform.
- FORUM, at the top right of the screen on the left of Calendar, used by users to create and submit topics for discussion.
- ACCOUNT, at the right of the screen below Other list, dropdown list used by users to handle their account settings and information.
- EXPORT PERSONAL DATA, at the right of the screen on the right of Account, used by users to export their personal data in a form of an html table.

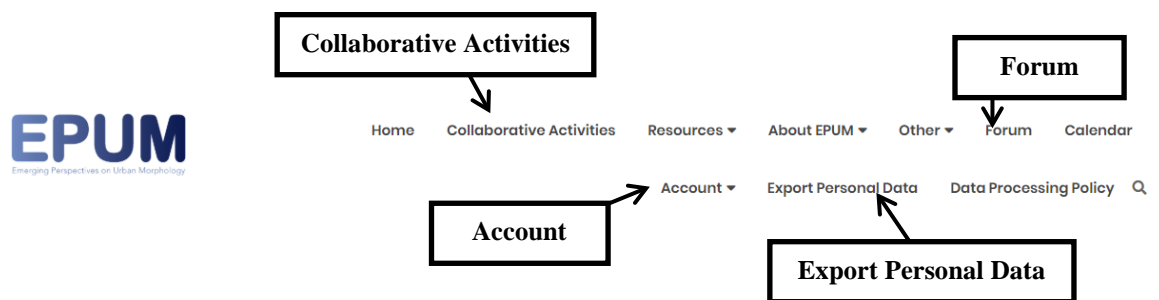


Figure 4.4.3. EPUM Platform Interface Navigation bar for logged-in users

4.4.1 User Functionalities

The user accesses the system via a web browser. The following functionalities are available:

1. Simple Search (see Section 4.4.1.1)
2. View Resources (see Section 4.4.1.2)
3. View information About EPUM (see Section 4.4.1.3)
4. View Other material (see Section 4.4.1.4)
5. View events on Calendar page (see Section 4.4.1.5)

6. Visit Facebook page (see Section 4.4.1.6)
7. Visit twitter page (see Section 4.4.1.7)
8. View Data Processing Privacy Policy (see Section 4.4.1.8)
9. Register (see Section 4.4.1.9)
10. Login (see Section 4.4.1.10)

The following functionalities are available only to logged-in users:

11. Manage Account (see Section 4.4.1.11)
12. Use Forum (see Section 4.4.1.12)
13. Collaborative Activities functionality (see Section 4.4.1.13)
14. Export Personal Data (see Section 4.4.1.14)

4.4.1.1 Simple Search

It allows performing a search on posts by providing a set of characters of what the user wants to search for. To initiate the simple search process, the user needs to click on the magnifying glass and then enter the searched text in the field located in the center of the screen and press enter.

4.4.1.2 View Resources

Several resources are presented to the user based on the category he/she has chosen. The user hovers over the Resources tab with his/her mouse and the platform opens a dropdown list from which the user clicks on the Case Studies, Key Texts or Videos. Afterwards the platform redirects the user to the selected category where he/she can click on the resource of his/her interest in order to view it.

4.4.1.3 View Information About EPUM

Several information about the EPUM project is presented to the user by selecting a specific option from the menu. The user hovers over the About EPUM tab his/her mouse and a dropdown list is opened from which he/she can choose the Overview, EPUM Website which displays to the user the project's website, EPUM Project which presents to the user information about the project, EPUM Partners which presents to the user information about all EPUM project's partners, or Open Learning Curriculum (OCL) by clicking on it.

4.4.1.4 View Other material

Several resources are presented to the user based on the category he/she has chosen. The user hovers over the Other tab with his/her mouse and the platform opens a dropdown list from which the user clicks on News, Glossary or FAQ. Afterwards the platform redirects the user to the selected category where he/she can click on the resource of his/her interest in order to view it.

4.4.1.5 View events on Calendar page

The user can view all the created events of all the CLAs and preview their information, such as the event's name, the name of the CLA it is related, the event's description, the date of the event and the event's creator.

4.4.1.6 Visits Facebook page

The user can visit EPUM project's Facebook page by clicking on the Facebook icon from the top bar menu.

4.4.1.7 Visit Twitter page

The user can visit EPUM project's Twitter page by clicking on the Twitter icon from the top bar menu.

4.4.1.8 View Data Processing Privacy Policy

The user can read the Privacy Policy of the platform which explains the purpose of the data processing and all other needed information by clicking on the "Data Processing Privacy Policy" tab on the navigation top bar menu.

4.4.1.9 Register

The users that don't have an account, in order to use the main functionality of the platform, which is the Collaborative Learning Activities (CLA), have to click on the "Register" tab of the top bar menu and fill the form presented to them. In the Registration form all fields are required for the system to function properly, an asterisk

is used after the field's name to make it identifiable to the user that the specific field needs to be filled. The required fields are username, first name, last name, email address, password, institution/organization and role. In the system the strong password functionality is used in order to ensure that the given password is difficult to be cracked. That means the user must enter a password that contains at least 8 characters from which one character must be a lowercase letter, one must be a capital letter and one must be a number. For the registration function to be completed it is required that the user read the "Privacy Policy" of the platform and confirmed that he/she agree with them. Then, the user clicks on the "Register" button to create his/her account. After the creation of the account the user is transferred to his/her "Profile" page. In the registration form validation checks are performed from the "Ultimate Member" plugin to ensure that no required fields would be missing, the password's structure will match the given rules, the password and confirmation password values will be identical and the username and email doesn't already exist to another account.

4.4.1.10 Login

Users that already have an account, in order to login, they need to click on the "Login" tab on the top bar menu. Afterwards the user is transferred to the "Login" page where he/she needs to provide the presented form with his/her credentials and click on the "Login" button, in order for the system to validate his/her credentials and log him/her in. After the successful login the user is redirected to his profile page. Appropriate validations are performed in the background to prevent errors created by missing to fill required fields, providing incorrect username/email or password. Additionally, the user has the opportunity to reset his/her password if he/she has forgotten it by clicking on the "Forgot your password?" link. For the password reset process, the user needs to enter his/her username or email address and click the "Reset my password" button. Afterwards, an email will be sent to the user's email account where he/she will be transferred to the "Password Reset" page where he/she will be able to enter his/her new password and save the change.

In the case where the user has restricted his/her account, in order for him/her to be able to login must first unrestrict it. To unrestrict an account the user clicks on "Restricted Account? Click here to unrestrict!" button in the "Login" page. When the user clicks on the button the unrestriction form is presented to him/her. After the user provides the

form with his/her username and password and clicks on the “Unrestrict Account” button, he/she gets a notification message that informs him/her about the account unrestriction and an email. When the account recovers from the restriction, the user is transferred to his/her profile page.

4.4.1.11 Manage Account

4.4.1.11.1 My Profile

The user has the ability to manage his account settings and information presented on his profile if he/she has an account. After the user logs in, he/she can manage his/her account from the page that is redirected, namely “Profile” page, by clicking on the gear icon. The user can view his/her profile also by clicking on the “My Profile” tab of “Account” tab dropdown menu.

4.4.1.11.2 My Account

If the user clicks on “My Account” tab the “Account” page will be presented to him/her. By default, the first thing that the user views is the form with his/her data that can change/update and then click on the “Update Account” to save the new data. If the user clicks on “View profile” text then he/she is transferred to his/her profile page. The user can visit his/her account also by clicking on the “Account Settings” tab of “Account” dropdown menu.

If the user chooses to change his/her password, he/she can click on the “Change Password” tab from the side menu and then submit the presented form. The user has to enter his/her current password and the new password that he/she wants to use from now on. To save the change the user has to click on the “Update Password” button.

4.4.1.11.3 Delete Account

If the user wants to delete his/her account from the system, he/she has to click on the “Delete Account” tab from the side menu and provide the presented form with his/her unique password. To complete this action, he/she has to click on the “Delete Account”

button to send the request to the system. Afterwards, the user is automatically logged out from the system and transferred to “Home” page.

4.4.1.11.4 Password Reset

If the user wants to reset his/her account, he/she needs to click on the “Password Reset” tab from the “Account” dropdown menu and the exact same interface as in the case of the “Forgot your password?” link in the “Login” page, is presented to him/her.

4.4.1.11.5 Restrict Account

If the user wants to restrict his/her account, then he/she should click on the “Restrict Account” tab from the “Account” drop down menu and the “Restrict Account” page is presented to him/her. By clicking the “Restrict Account” button, a popup message is presented to the user, that needs the confirmation from him/her to move on with the restriction of his/her account. If the user clicks on “Cancel” button then the popup closes and the account stays as it is, otherwise, if the “OK” button is clicked an informational message is presented to the user and his/her account logs out automatically and receives an email that informs him/her about his/her account status.

4.4.1.12 Use Forum

The user can visit the platform’s forum by clicking on the “Forum” tab on the top bar menu. There the users can preview topics discussed by other users and post their own.

4.4.1.13 Collaborative Learning Activities (CLA)

The user can use the main functionality of the platform, Collaborative Learning Activities, by clicking on the “Collaborative Activities” tab of the top bar menu. This functionality is role based, which means teachers and students have slightly different interfaces and information presented to them as well as different abilities as shown in Figure 4.4.1.13.1. All users have the ability to view all Collaborative Learning Activities of the platform, but they can access only those that they are assigned to, and the ones they have created themselves. A CLA can be created only by teacher role users. The teacher users are able to create new CLAs by clicking on the “+Create new CLA” button and fill the presented form with the CLA title, description and upload a brief file. None of the form fields are mandatory for the creation of the new CLA. After

the user has created the CLA, he/she can assign other teachers and/or students users to the specific CLA by clicking on the “View CLA” button and then click on the “Add CLA users” button. In the page presented to the user, he/she can preview the already assigned members but also assign new ones and remove assigned users. Users that are assigned to a particular CLA but aren’t the authors of it can only preview the members of that CLA by clicking on the “View CLA Users” button inside the specific CLA. Moreover, the author of a CLA can edit the information of his/her CLA by clicking the “Edit” button, update its information and save changes. Both roles of users can also create an event for a specific CLA that are members by clicking on the “+Create new Event” button and provide the presented form with the event title, description and data of the event. The CLA related events are presented with ascending order of date to the members inside the CLA and also at the open access calendar.

In case the user is a teacher, he/she has the opportunity to create a new resource, by clicking the “+Create new Resource” button, and afterwards provide the presented form with the resource title, description and upload a brief file which aren’t required. In case the user is a student, he/she has the opportunity to create a new student work, by clicking the “+Create new Student Work” button, and afterwards provide the presented form with the student work title, description and brief files which aren’t required. The author of a resource and the author of a student work can edit its information by clicking on the “Edit” button and update its information. Also the author of the work/resource or the author of the specific CLA that the work resides has the ability to delete his/her creation.

Both roles of users have the ability to view all resources and student works of the CLAs that are members of. By previewing the information of those materials, the user can download the brief files, if are available, by clicking on their links. Users are able to take part in the discussion on a CLA that are members of, by clicking on the “Discussion” button. Moreover, users are able to give peer review on student works by selecting a student work that they want to comment on, and post their comment at the corresponding section below. Lastly, users that want to be assigned to a CLA can send a request to the CLA’s author by clicking on the “Request to Join CLA” button, and the system, will automatically send an email to the CLA author, and then the author can

decide whether or not to assign that user to the CLA, through the add user button discussed above.

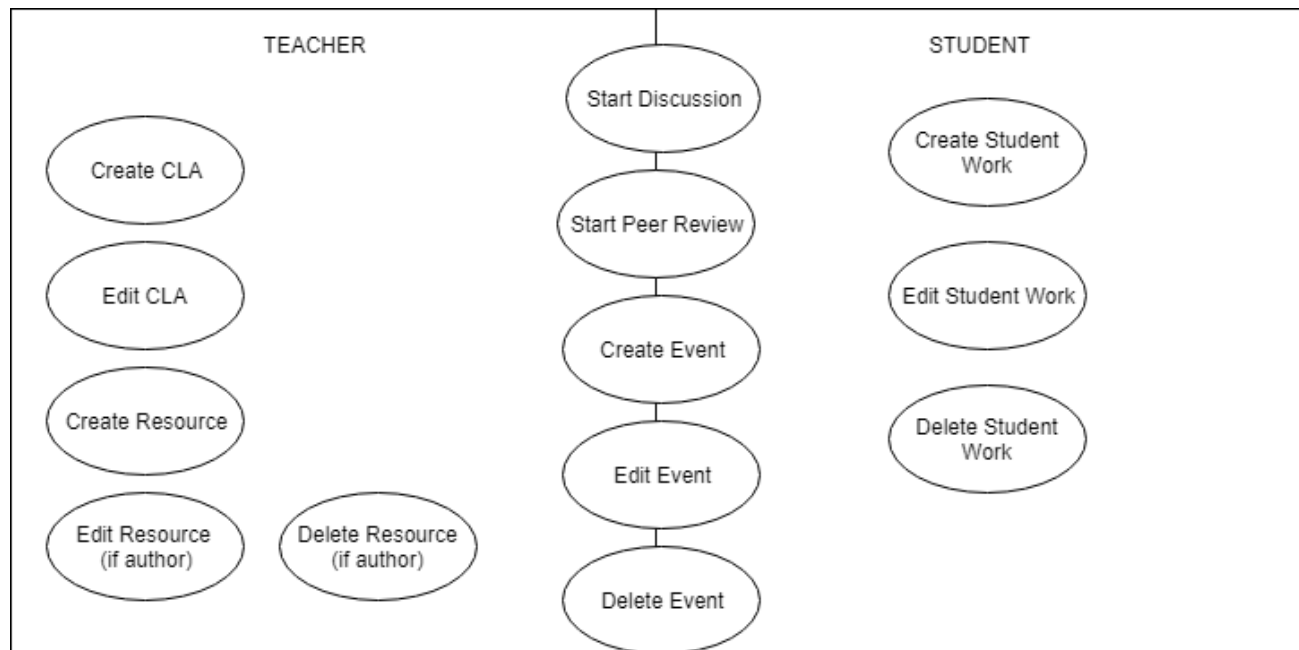


Figure 4.4.13.1. CLA functionalities

```
$stmt = $con->prepare("INSERT INTO `ucy_clas`(`ID`, `Title`, `Description`, `Brief`,
`Author`) VALUES (NULL,?,?,?,?)");
$stmt->bind_param("ssss", $title, $descr, $filetmp, $current_user);
$stmt->execute();
if(move_uploaded_file($_FILES['file']['tmp_name'], $target2)) {
    //Tells you if its all ok
    echo "The file ". basename( $_FILES['file']['name']). " has been uploaded, and
your
        information has been added to the directory";
} else {
    //Gives and error if its not
    echo "Sorry, there was a problem uploading your file.";
}
$stmt->close();
```

The code shown above creates a statement with bind variables that when executed the new CLA will be created. Because the field Brief in CLAs refers to files for the CLA

creation, the function `move_uploaded_files($FILE['file'][$tmp_name],$target)` upload the file to the directory specified, , namely the value of `$target` which in this case is a directory in the server for the EPUM project.

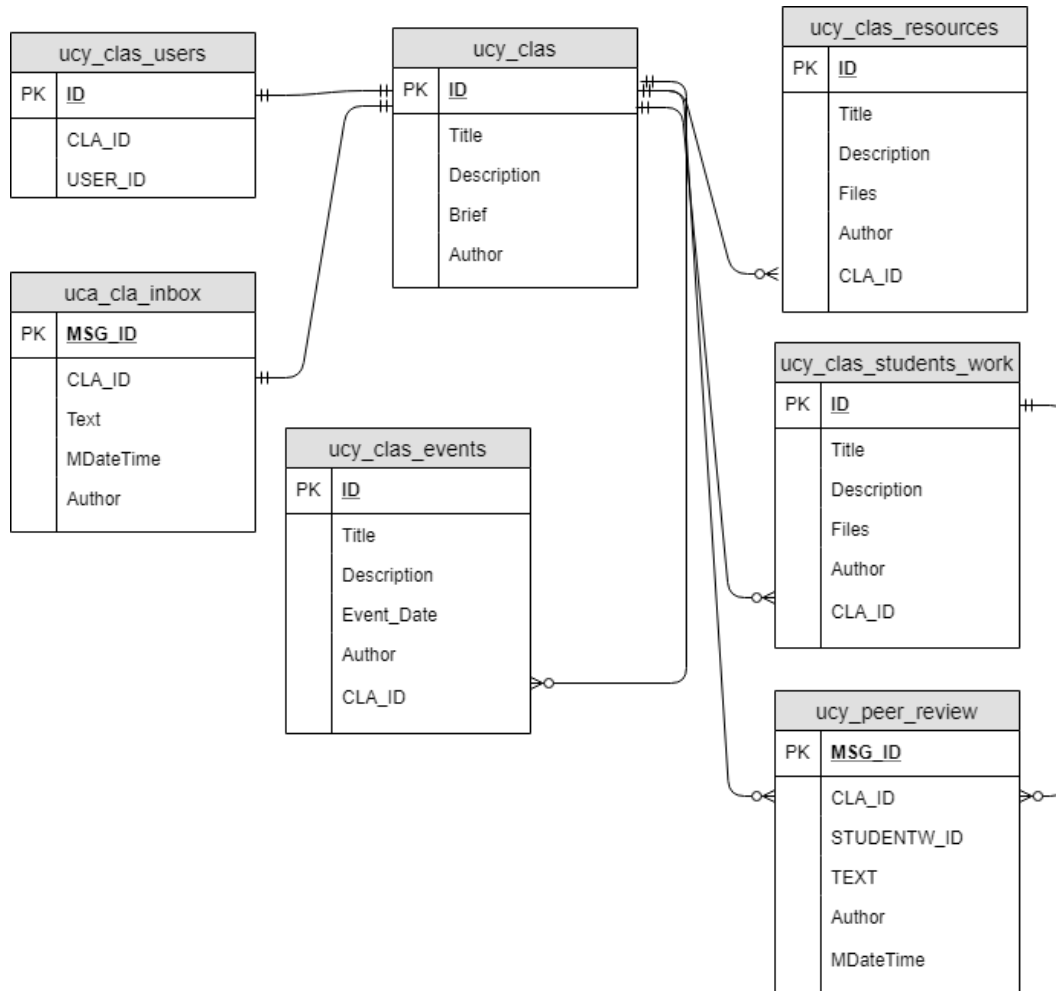


Figure 4.4.13.2. CLA tables dependencies

Above the dependencies between the CLA related tables are shown.

4.4.14 Export Personal Data

The user has the ability whenever he/she wishes to export by himself/herself his/her personal data. This can be achieved by clicking on the “Export Personal Data” tab on the navigation top bar menu. The user will be transferred to the “Export Personal Data”

page from which he/she clicks on the “Export Personal Data” button to download an html file with the user’s personal data.

4.5 GDPR functionality Implementation

In this section, the GDPR articles discussed in Chapter 3, are presented in practice describing how they have been implemented into the EPUM e-Learning Platform.

4.5.1 Data Minimization

The EPUM platform complies with the Data Minimization principle, which is applied by asking the user to provide willingly only the necessary required information that are needed for the purpose and functionality of the e-Learning platform. This information are provided during the registration of a user account and consist of username, first name, last name, email address, institution/organization, password and role (account type). Username/Email and password are required in order to achieve the login function of a user. Also, email address is used to confirm the user’s identity, and so it is necessary to complete the user’s registration. First and last name and institution/organization are necessary in order for the user to be identified by his/her colleagues as a valid teacher or student of the respective organization. Due to the fact that the EPUM platform is as e-Learning platform providing a teaching methodology that can be used in the context of a university course, the users must have a way to be identified easily by teachers and students. Moreover, the user role, which is considered as personal data because it declares a property of the user, is also necessary since it enables different functionalities and abilities based on the account type. The purpose of storing and processing any of the collected user personal data is described in the EPUM Platform Privacy Policy. No other data are asked by the user, neither in a mandatory, nor an optional way.

4.5.2 Lawfulness of Processing

As explained in the Privacy Policy, during the registration operation, a user is considered to be taking steps towards entering a contract which will make him/her able to be benefited from the platform’s free provided services. The EPUM Platform complies with the Article of Lawfulness of Processing by requesting from the user to agree on accepting the policy regarding storing and processing his/her personal data, in order to be able to use the platform’s provided services, thus complying to the lawful

basis of performance of a contract. The lawful basis formation is deployed during the registration of a user to the platform, where the user willingly fills the registration form with his/her personal data. Afterwards, the user is compelled to give his/her agreement on accepting the storing and processing of his/her personal data, which is described in the Data Processing Privacy Policy of the platform, by ticking the appropriate checkbox.

The Data Processing Privacy Policy is articulated in clear, detailed and readable form for the users to easily understand its meaning. It describes all purposes and processing that the personal data might go through. If during the registration, all personal data fields are properly filled and the checkbox of the confirmation of the agreement on the privacy policy of the system is checked, and then by clicking on the registration button the data are stored into the database. If the user doesn't click on the registration button to complete his/her action, then all filled data are discarded and they are never stored or processed.

4.5.3 Right to Rectification

EPUM Platform complies with the Right to Rectification by giving to the user the opportunity, at any given time, to edit his/her personal information displayed in his/her profile or modify his/her account information. This right provides the user with the option to correct and update any stored information about himself/herself.

The user can edit all his/her personal data stored except from the username. Old information that the user has updated will be deleted from the database and updated with the new values. All changes will be stored and presented to the user immediately. This functionality is implemented in the platform in the profile and account page of the user, where at each one the user is able to choose to update his/her account on that page.

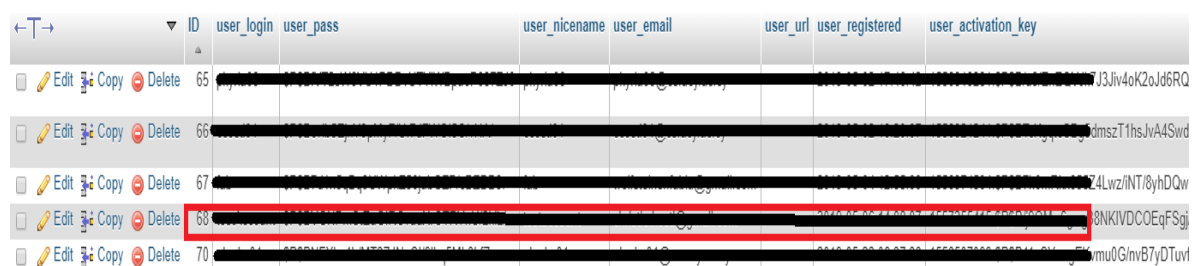
4.5.4 Right to Erasure

The Right to Erasure was implemented into the EPUM platform by providing the user the ability to delete his/her account at any given time, as explained in the Privacy Policy. When the user selects the Delete Account option, he/she is informed that his/her personal data will be deleted, and is called to provide his/her password in order to validate the user's identity. After the system validates the user's identity, the system

proceeds with executing several queries to the database on all relevant database tables in order to find and delete all stored data linked to the specific user. No personal data should be kept after the user's account deletion, unless their processing is for any reason subject to an exception rule. The process of user's account deletion is described in the Data Processing Privacy Policy.

Regarding the basic and the user management functionality, the WordPress and the Ultimate plugin take care of this erasure. Furthermore, our own coded functionality plugins, and mainly the CLAs, store a set of personal data for each user, such as the CLA the user has created, peer review posts on student works, discussion posts on CLAs, events, etc. Because the above information are essential for the e-Learning platform to be whole and work properly, the "Delete Account" functionality was propagated to our own coded functionality triggering the anonymization of the user's personal data in order to destroy the links that was relating the user to the above information.

In Figure 4.5.4.1 and 4.5.4.2, the database table that stores the users data upon registration with the EPUM Platform and therefore with WordPress is presented. User with ID 68 has deleted his/her account and as a result the record of the specific user has been deleted from the users table as presented in Figure 4.5.4.2. In Figure 4.5.4.3, the anonymization that happened on the student work which User with ID 68 has created is presented.


















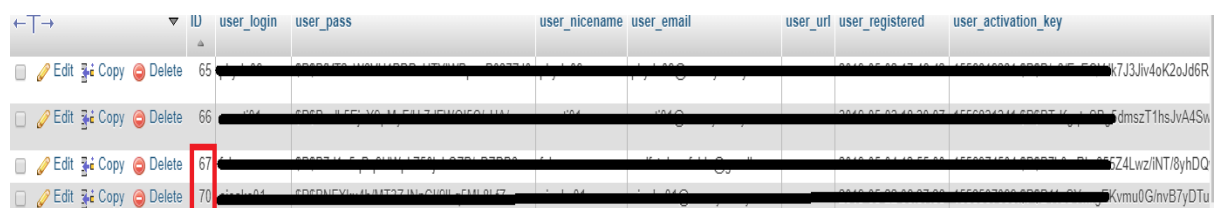
	ID	user_login	user_pass	user_nicename	user_email	user_url	user_registered	user_activation_key
  	65	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	66	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	67	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	68	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	70	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Figure 4.5.4.1. Database table of EPUM's users















	ID	user_login	user_pass	user_nicename	user_email	user_url	user_registered	user_activation_key
  	65	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	66	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	67	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
  	70	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Figure 4.5.4.2. Database table of EPUM's users after account deletion

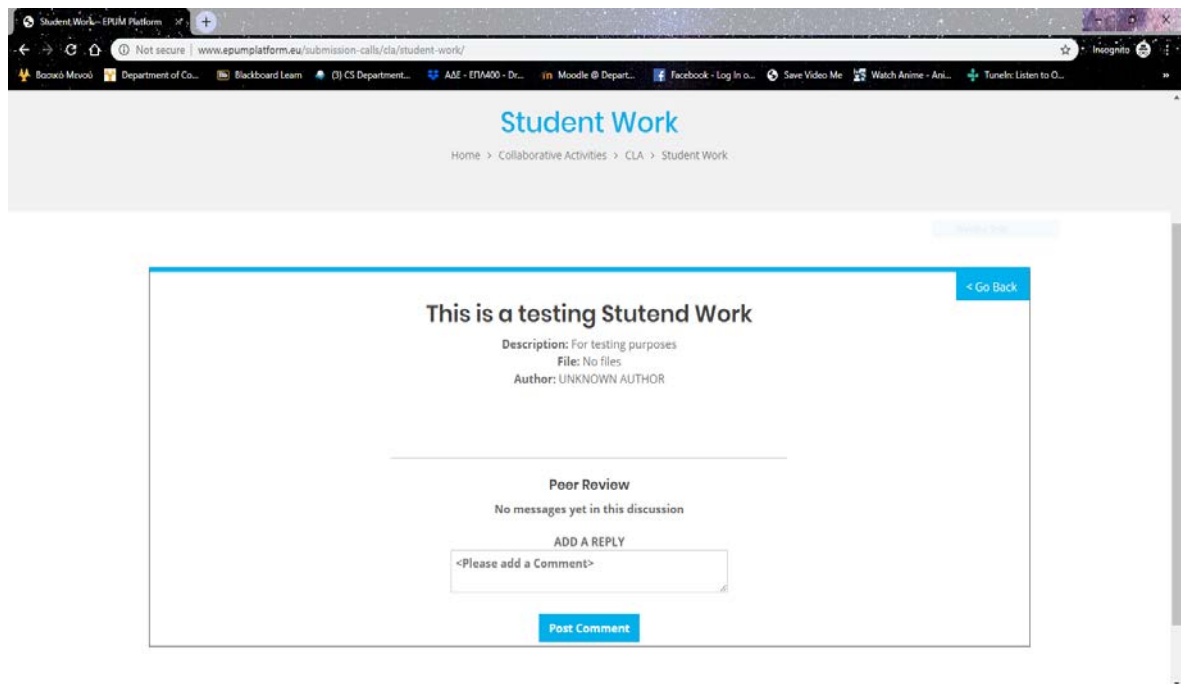


Figure 4.5.4.3. Anonymization on Student Work after deletion of the author

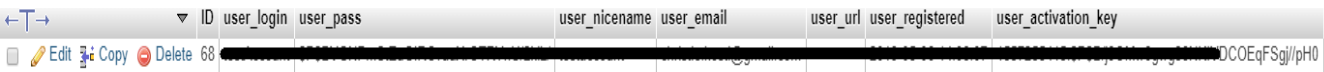
4.5.5 Right to Restriction of Processing

The EPUM Platform complies to the Right to Restriction of Processing Article, which is applied by giving the user the ability to restrict his/her account without requesting it from the administrator and automatically forbid the platform from processing his/her personal data, as explained in the Privacy Policy. When the Restrict Account option is selected, the users are informed that their accounts will be restricted and therefore their data will not be processed until they unrestrict their accounts. After the user confirms that he/she wants to restrict his/her account the system redirects him/her to the “Home” page after it logs him/her out of the account. For the restriction functionality a new table was constructed in the database with similar structure to the one that stores the users in order to move the restricted ones there. The record of the restricted user is fetched through an sql statement from the general table of the users that was created by WordPress. The specific record gets copied in the restricted users table and the values of the record in the wp_users table are updated to “NaN” or “00-00-000 00:00:00” based on the type of the value in order to delete every known relation of the other tables to the

specific user. In case the restricted user was author of a CLA/resource/work then in the Author field the “UNKNOWN AUTHOR” is presented.


In order for a restricted user to login into his/her account, he/she needs first to unrestrict it. The restricted user is able to unrestrict his/her account by clicking on the “Restricted Account? Click here to unrestrict!” button in the “Login” page. Then, the user needs to provide the presented form with his/her username and password in order for the system to validate them. The username and password validation was implemented by using the `wp_check_password($current_user_password, $user_pass, $ID)` function that is used by the “Ultimate Member” plugin to validate the inputs from the login form. The `$current_user_password` variable refers to the password that the user has inserted to the unrestriction form, the `$user_pass` refers to the password that the restricted user with `id=$ID` has. Appropriate checks are done in order to inform the user of either incorrect username or password. Finally, if the username and password match those of the restricted user then the record from the restricted users table gets deleted after the appropriate record in the `wp_users` table gets restored. Also, restriction and unrestriction process construct appropriate emails that will be sent to the specific user upon the selected function.

As shown in Figure 4.5.4.1, the user with ID=68 has a record in the `wp_users` table in the database. In Figure 4.5.5.1 the specific record of the user is moved to the `restricted_users` table in the database and the record in the `wp_users` is updated to meaningless values as shown in Figure 4.5.5.2.



	ID	user_login	user_pass	user_nicename	user_email	user_url	user_registered	user_activation_key
	68							

Figure 4.5.5.1. Restricted users table in database



	67							
	68	NaN	NaN	NaN	NaN	NaN	0000-00-00 00:00:00	NaN
	70							

Figure 4.5.5.2. wp_users table in database

4.5.6 Right to Access of Data and Right to Data Portability

Access to data provided by WordPress allows the user to export his/her personal data in ZIP files, using data gathered by WordPress and participating plugins. This is not an automated functionality, as it is only included by default in the “Tools” tab from the Side Menu, under the “Export Personal Data” option in the administration panel of the platform (where only an administrator has access). The user should first notify the admin about wanting to access his/her data, and the admin then act accordingly. A Double opt-in confirmation email system is added in this functionality to ensure privacy protection. In the EPUM platform, the user can access directly some of his/her personal data, namely his/her profile personal data, stored in the system through the user profile page. However, other personal data can be accessed after corresponding demand has been performed by the user as explained above.

The EPUM platform is enabling an automatic process, that was integrated in our own coded plugins, that the user can directly export his/her personal data. As described in the Data Processing Privacy Policy, the user is able to export directly his/her personal data by selecting the “Export Personal Data” tab in the navigation menu and chooses to download the file. After the user clicks on the appropriate button then an html file is downloaded, that contains all user’s personal information presented in a table form as presented in Figure 4.5.6.2. The automated procedure executes a set of database queries, based on the user’s identity to construct the user personal data report table.

The format of the exported file was defined by the following code:

```
// We'll be outputting an HTML file
```

```
header('Content-type: application/html');
```

```
// It will be called personal_data.html
```

```
header('Content-Disposition: attachment; filename="personal_data.html");
```

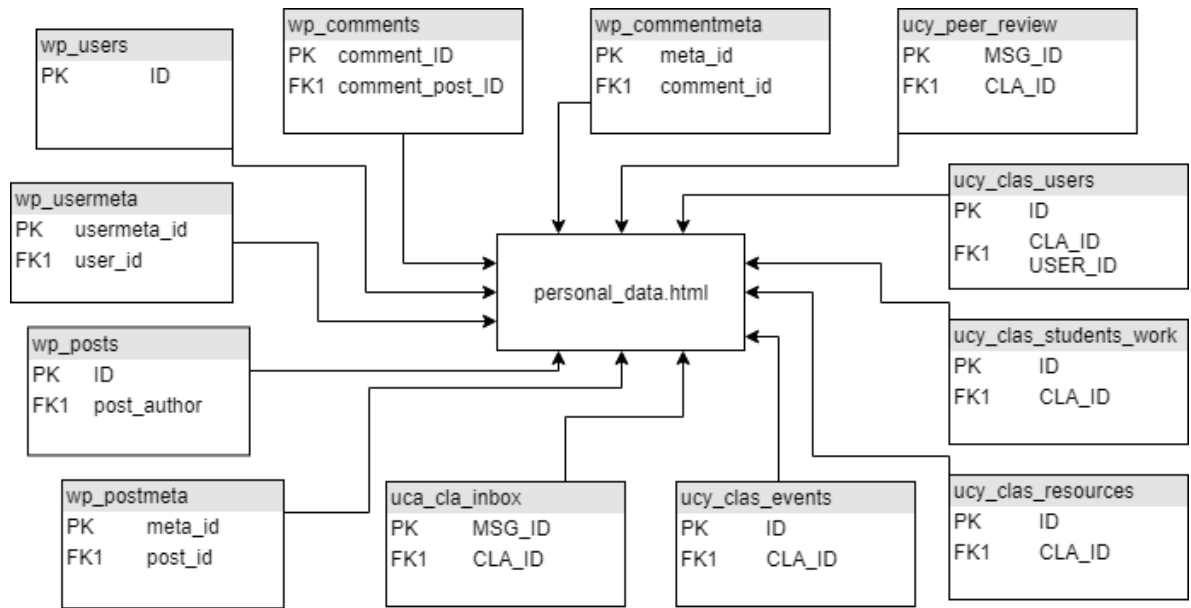


Figure 4.5.6.1. Tables of the database that their data is used to construct the exported file

Figure 4.5.6.1 shows all the tables that needed to fetch their data related to the specific user to construct the personal_data.html file.

In the code below, the SELECT query executed with mysqli_query() function on the wp-users table is presented along with the code that presents the fetched data as an html table in the html file which is going to be exported.

```

/*          WP_USERS          TABLE          */
$result_wp_users = mysqli_query($con,"SELECT user_login,user_pass,
user_nicename,user_email,user_url,user_registered,user_activation_key,user_status,display_name
FROM wp_users WHERE ID=$current_user");
$x=0;
while($row_wp_users = mysqli_fetch_assoc($result_wp_users)){
    if ($x==0) {
        echo "<h2>User Information</h2>";
        echo "<table>";
        echo "<tr>";
        echo "<th>User Login</th>";
        echo "<th>User Password</th>";
        echo "<th>Username</th>";
    }
}

```

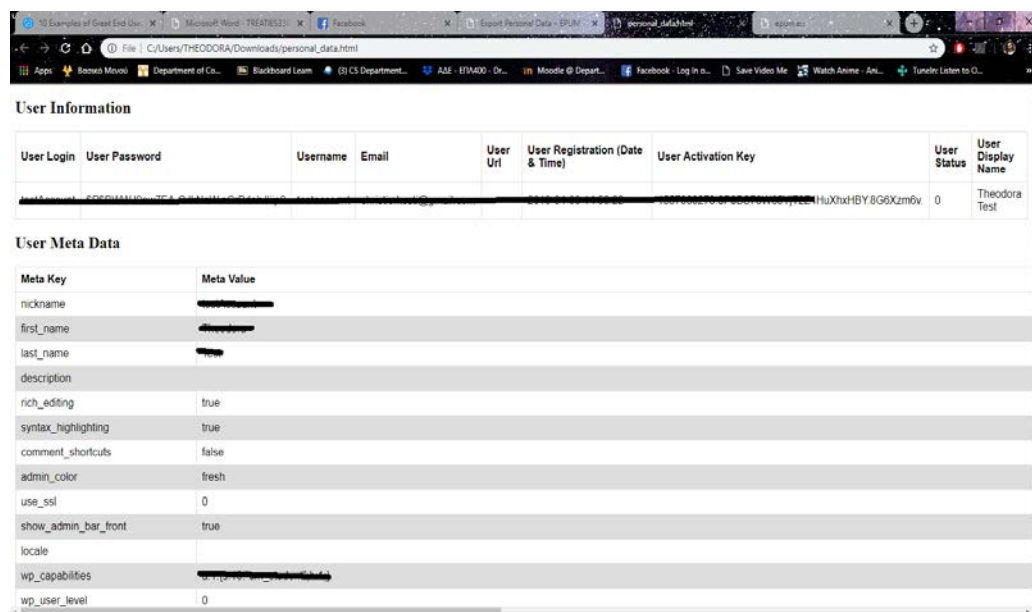


```

<th>Email</th>
<th>User
<th>User      Registration      (Date      &      Time)</th>
<th>User      Activation      Key</th>
<th>User      Status</th>
<th>User      Display      Name</th>
</tr>";
echo
"
}
echo
"<tr><td>".$row_wp_users["user_login"]."</td><td>".$row_wp_users["user_pass"]."</td><td>".$row_wp_users["user_nicename"]."</td><td>".$row_wp_users["user_email"]."</td><td>".$row_wp_users["user_url"]."</td><td>".$row_wp_users["user_registered"]."</td><td>".$row_wp_users["user_activation_key"]."</td><td>".$row_wp_users["user_status"]."</td><td>".$row_wp_users["display_name"]."</td></tr>";
$x=1;
}

```

Query and presentation code of wp_users table



User Information

User Login	User Password	Username	Email	User Uri	User Registration (Date & Time)	User Activation Key	User Status	User Display Name
1		THEODORA	theodora@theodora.com		2020-01-01 00:00:00		0	Theodora Test

User Meta Data

Meta Key	Meta Value
nickname	
first_name	
last_name	
description	
rich_editing	true
syntax_highlighting	true
comment_shortcuts	false
admin_color	fresh
use_ssl	0
show_admin_bar_front	true
locale	
wp_capabilities	
wp_user_level	0

Figure 4.5.6.2. personal_data.html file preview

4.5.7 Data Protection by Design

By integrating all the above articles as explained, throughout the platform's software development process, from the specifications and design phases to the implementation of the platform, compliance to the provision for Data Protection by Design was achieved.

4.5.8 Security Measures

Regarding security, some measures additional to those implemented by WordPress were taken. In order to prevent EPUM platform from being attacked with SQL injection, the database error reporting was configured to not give away information that is valuable for attackers, such as table names, field names, etc. Also, there were used bound variables inside the SQL statements, as follows:

```
$stmt = $con->prepare("INSERT INTO ucy_restricted_users(`ID`, `user_login`,  
`user_pass`, `user_nicename`, `user_email`, `user_url`, `user_registered`,  
`user_activation_key`, `user_status`, `display_name`) VALUES (?,?,?,?,?,?,?,?,?)");
```

```
$stmt->bind_param("ssssssss", $ID, $user_login, $user_pass, $user_nicename,  
$user_email, $user_url, $user_registered, $user_activation_key, $user_status,  
$display_name);
```

```
$stmt->execute();
```

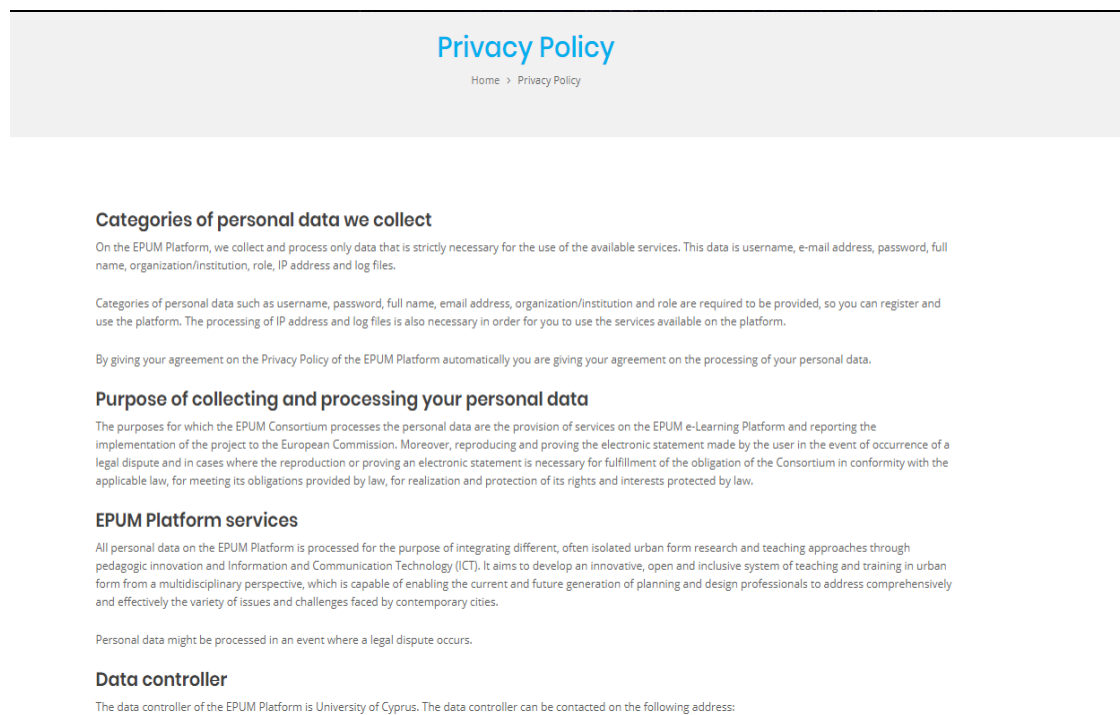
In the above code the sql statement gets prepared by setting each value for a column of the ucy_restricted_users table to parameter "?". Afterwards, the "?" parameter gets bound to the "s" which refers to the right string variable, for example the first "s" refers to the \$ID variable. Note, that all values here, even arithmetic ones, were handled as strings. Finally, after every variable gets bound, the sql statement is executed.

Additionally in each php file that is related to a webpage the current user is checked in order to prevent unauthenticated users to have access in the specific webpage. Moreover, validation checks are executed after trying to complete the registration and login action. The password asked for the registration and therefore login function is

required to be at least 8 characters from which one is a lowercase letter, one is a capital letter and one is a number. Additionally, password uses an encryption hash method by Ultimate Member plugin and WordPress in order to make it non readable identifiable. For specific actions anonymization is used to the user's data.

4.5.9 Privacy Policy

The Privacy Policy defines in a clear way the purposes and the processing of personal data by the e-Learning platform in compliance with GDPR. Specifically, it states the Data Protection by Design, article 25. In the platform processing of data is considered lawful due to the privacy policy that states in a clear way the purpose of processing and storing personal data. The compliance to Data Minimization principle is defined in the Privacy Policy and justified in the platform due to the minimum amount of data required for the user to have a functional user experience in the platform. Finally, the privacy policy states the rights of the data subject¹⁵ which are the Right of access by the data subject, Right to rectification, Right to erasure, Right to restriction of processing and Right to data portability.



Privacy Policy
Home > Privacy Policy

Categories of personal data we collect
On the EPUM Platform, we collect and process only data that is strictly necessary for the use of the available services. This data is username, e-mail address, password, full name, organization/institution, role, IP address and log files.

Categories of personal data such as username, password, full name, email address, organization/institution and role are required to be provided, so you can register and use the platform. The processing of IP address and log files is also necessary in order for you to use the services available on the platform.

By giving your agreement on the Privacy Policy of the EPUM Platform automatically you are giving your agreement on the processing of your personal data.

Purpose of collecting and processing your personal data
The purposes for which the EPUM Consortium processes the personal data are the provision of services on the EPUM e-Learning Platform and reporting the implementation of the project to the European Commission. Moreover, reproducing and proving the electronic statement made by the user in the event of occurrence of a legal dispute and in cases where the reproduction or proving an electronic statement is necessary for fulfillment of the obligation of the Consortium in conformity with the applicable law, for meeting its obligations provided by law, for realization and protection of its rights and interests protected by law.

EPUM Platform services
All personal data on the EPUM Platform is processed for the purpose of integrating different, often isolated urban form research and teaching approaches through pedagogic innovation and Information and Communication Technology (ICT). It aims to develop an innovative, open and inclusive system of teaching and training in urban form from a multidisciplinary perspective, which is capable of enabling the current and future generation of planning and design professionals to address comprehensively and effectively the variety of issues and challenges faced by contemporary cities.

Personal data might be processed in an event where a legal dispute occurs.

Data controller
The data controller of the EPUM Platform is University of Cyprus. The data controller can be contacted on the following address:

Figure 4.5.9.1. Preview of Privacy Policy page

¹⁵ The GDPR indicates that a data subject is any person whose personal data is being collected, stored or processed by an organization.

Chapter 5

Platform Evaluation

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5.1 Evaluation Method

The method of evaluation used in the EPUM Platform was an internet questionnaire which is a specific set of written closed questions that aims to extract specific information from the chosen respondents. The questions and answers are designed in order to gather information about attitudes, preferences and factual information of respondents.

In the context of the development of the EPUM Platform I constructed a complete questionnaire which will evaluate the system in all of its aspects. For the questionnaire were used mostly rating scale questions and some open, list or grind questions.

5.2 User Evaluation

5.2.1 The Questionnaire

In the questionnaire there is an introduction paragraph explaining its purpose to the user and giving him the opportunity to decide if he/she accepts to give consent on the questionnaire by answering it. The Questionnaire includes 7 sections for each type of

user. There are 8 demographic questions in section 1, 17 GDPR related questions based on the platform's functionality in section 2 to evaluate the awareness and the understanding of the privacy by any potential user of an e-Learning platform. There are 6 questions related to CLA functionality in section 3 and afterwards 7 questions about teachers' functionalities in section 4 and 4 questions about students' functionalities in section 5. Lastly there are 7 questions about EPUM platform in section 6 and 10 questions about platform's usability in section 7 that were created using the SUS evaluation method. Sections 3 to 7 are referred to the specific users of the Collaborative Learning Activities functionality and the project partners.

In the context of the thesis project only section 1 and 2 were answered by the users in order to evaluate how the GDPR can improve the privacy and safety of the users' personal data but also how friendly and understandable are the GDPR articles to the platform's users. After the completeness of the thesis project, the complete questionnaire will be answered by the users in order to conduct a research to evaluate the necessity of the CLA's functionalities along with the usability of the platform.

The questionnaire can be found in Appendix C and in the following link in electronic form: <https://forms.gle/cQdRQFRjSzMPmL49A>

5.2.2 Evaluation Results

The EPUM platform questionnaire was answered by 20 people of an age range from 19 to 39 years old. Most of them were from Cyprus. After the analysis of the given answers I came up with the following results:

Regarding the Privacy Policy most of the respondents have located easily the Privacy Policy page and found the text and context understandable to them.

1. Rate the level of difficulty in locating the privacy policy of the platform.



20 responses

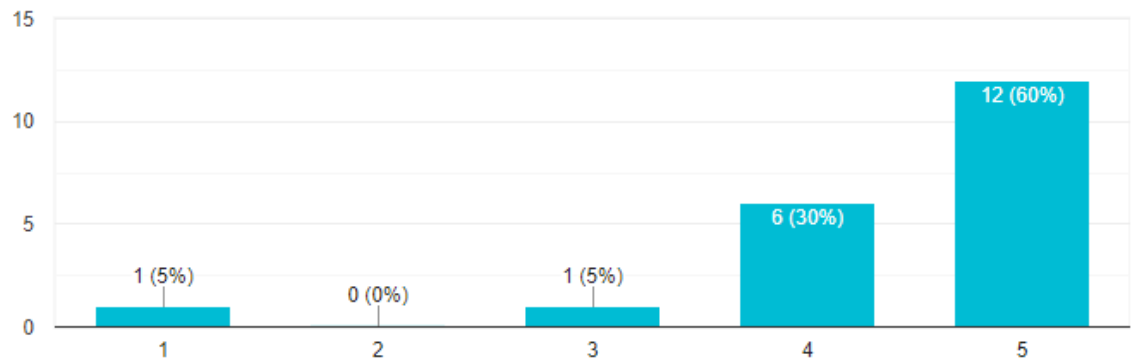


Figure 5.2.2.1 GDPR question no 1

2. How unclear(1) or clear(5) is, in the privacy policy, the purpose of collecting and processing your data.



20 responses

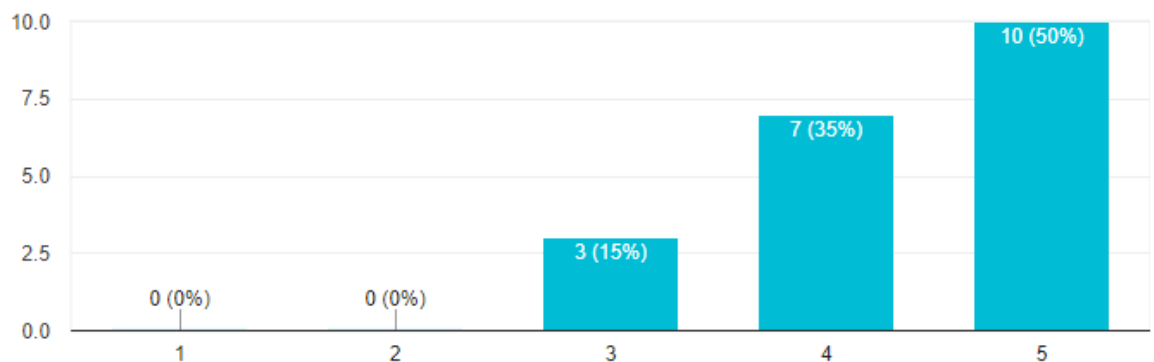


Figure 5.2.2.2 GDPR question no 2

Additionally, almost all of the respondents understood that all fields in the registration form were required for them to create an account. 10 of the respondents did not have any problem providing those required fields, but 6 of the respondents did not feel at easy providing their organization/institution. Due to the context of the EPUM platform, that is an e-learning platform that will be used concarenly form different universities the specific field must be required.

4. Which of the following required fields you would prefer not to fill?

19 responses

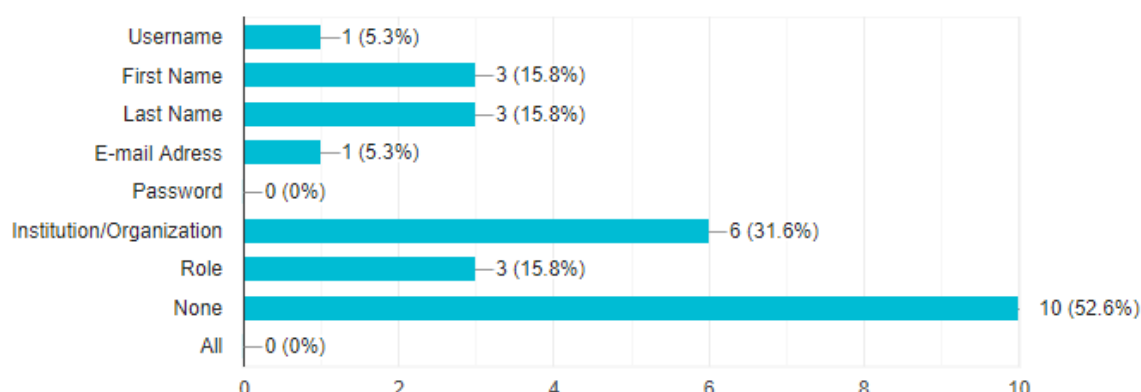


Figure 5.2.2.3 GDPR question no 4

Most of the respondents understood that their personal data will be stored in the platform as long as they have an active account in the platform, as well as that after deletion or restriction of their account they withdraw their consent.

10. How unclear(1) or clear(5) is it to you that after you delete or restrict your account you withdraw your consent?

20 responses

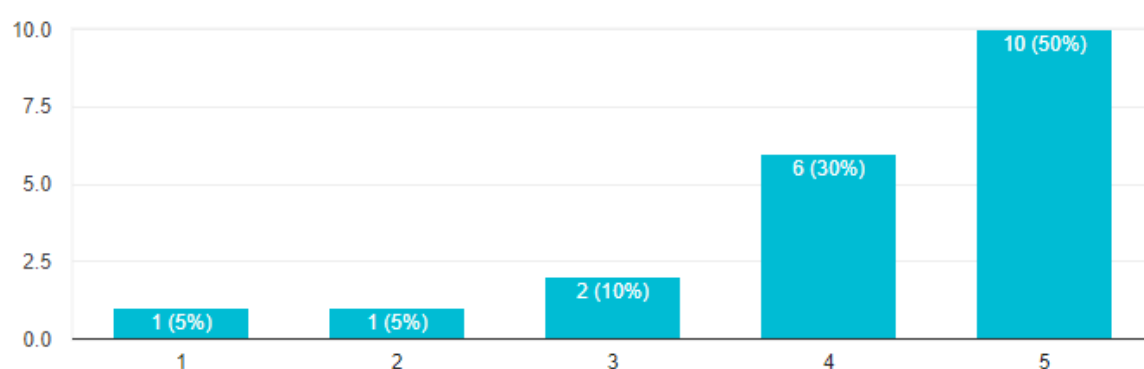


Figure 1. Figure 5.2.2.4 GDPR question no 10

Moreover, most of the respondents understood what will happen to their personal data and account in case of deletion and restriction, but some of them thought that after deletion they can reactivate their accounts.

13. If you were to delete or restrict your account what actions of the following do you expect to happen (can choose more than one)?



Figure 2. Figure 5.2.2.5 GDPR question no 13

Lastly, all of the respondents found the format of the exported data understandable.

17. After exporting your personal data, rate the level of your understanding of the format.

19 responses

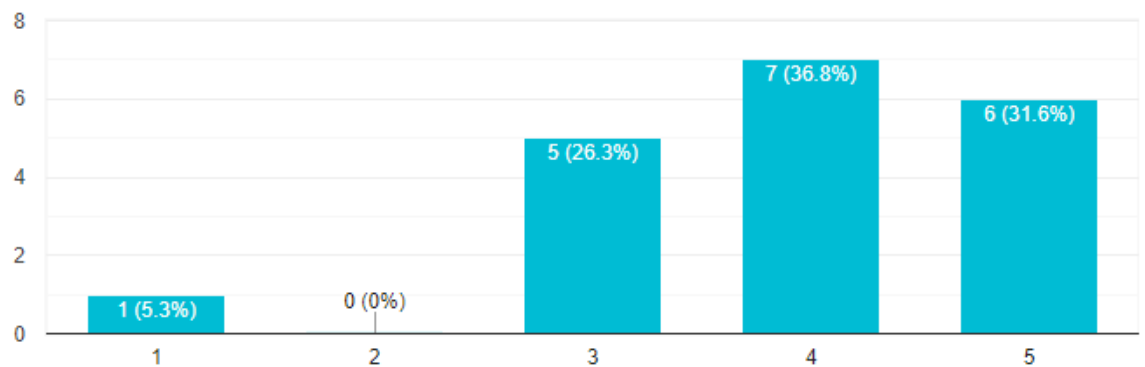


Figure 3. Figure 5.2.2.6 GDPR question no 17

5.3 Testing

The platform was tested during different stages of the implementation, gathering feedback from the users, and adjusting the functionality accordingly. It is at the moment being used in a test basis, by the actual end users.

Chapter 6

Conclusions and Future Work

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6.1 Introduction

During the development of this diploma thesis and through the analysis and further study of Privacy and GDPR as well as design and implementation of the EPUM platform, led to some conclusions. In this chapter these conclusions will be presented as well future work that can be done to improve compliance of the platform with GDPR.

6.2 Conclusions

Through the elaboration of this individual thesis which concerned the development of a user managements based e-Learning platform through privacy preserving and secure development that complies with GDPR, some conclusions have been reached.

The use of e-learning platforms for distance learning is becoming more and more common. Due to the General Data Protection Regulation, all organizations that store and process personal data of EU residents must comply with the new regulations.

With the full development of the EPUM platform and integrating functionality in order to comply with the GDPR, this could be considered an example of an e-learning platform that complies fully with the GDPR in terms with the software development terms.

6.3 Future Work

We could use the GDPR plugin by Trew Knowledge in order to provide to the user the ability to check and track his/her cookies, as well as the telemetry tracker functionality that displays to the user all of his/her data that are sent outside of the platform's server to other destination. Moreover, we could develop additional plugins in order to embed more GDPR related functionality to the platform.

Additionally, an SSL Certificate could be purchased in order to be added to the platform's domain to employ HTTPS instead of HTTP.

Methods on backup functionalities could be integrated related to what happens to backed up data when the user deletes or restricts his/her account. More provisions of the GDPR can be explored and integrated to platforms.

Finally, we could integrate better ways to present the Privacy Policy and other GDPR-related explanations as well as develop plugins that could be embedded on different content management systems in order to provide GDPR compliance.

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<https://www.mthreeconsulting.com/blog/2017/04/the-6-privacy-principles-of-gdpr>

Appendix A

Plug-ins State of the Art

GDPR	Details	Plugins
Security: encryption of data	1. ChaCha20-Poly1305 2. PHP function-openssl_encrypt, openssl_random_pseudo_bytes (int \$length), base64_encode (string \$data) 3. Generate key: PHP function- hash (string \$algo , string \$data). 4. Plugin function email_mask(\$email, \$character = '-')	1. DivertDigital GDPR-By Divert Digital Ltd (https://wordpress.org/plugins/divertdigital-gdpr/) 2,4. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description) 2,3. WooCommerce GDPR (DSGVO) Data Protection-By codemenschen (https://wordpress.org/plugins/wp-gdpr-data-protection/)
Security: decryption of data	1. PHP function-openssl_decrypt, base64_decode (string \$data)	Same as above
Double opt-in confirmation email	1. Plugin function <ul style="list-style-type: none"> • send_request_email() • request_confirmed() 2. Email-based method that site owners can use to confirm personal data requests (works for export and erasure requests, and for registered users and commenters) 3. Plugin features. <ul style="list-style-type: none"> • Turn on double opt-in for 	1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description) 2. Wordpress updated version 3. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)

MailChimp subscribers.		
Data breach notification on	<p>1. Plugin function</p> <ul style="list-style-type: none"> • Send data breach notifications to all users. (Side menu GDPR->Tools->Data Breach) Email confirmation will be sent to data controller after all required information is entered. On confirmation, begin sending bulk emails to all registered users. (Default 100 notification emails per hour, change the number in plugin settings) • prepare_data_breach_emails(\$key) • send_data_breach_emails(\$emails, \$data) 	<p>1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p>
Right of Access	<p>1. Plugin feature</p> <ul style="list-style-type: none"> • Data controller: can view the data you have for a user (Side menu GDPR->Tools->Access data tab) and search for the user's email. You will be prompted with the data and options to download it in JSON/XML formats. • Data subject: can check his/her information by submitting a request through one of the plugin's forms (php function 	<p>1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p>

	<p>gdpr_request_form('export-data') / shortcode [gdpr_request_form type="export-data"]). He/she will be prompted to confirm the request on their email. On confirmation, a download will begin with all their data in the chosen format.</p>	
Right to Data Portability	<p>1. Plugin function</p> <ul style="list-style-type: none"> file_export_data(\$email, \$format, \$key) generate_export(\$email, \$format) <p>2. dataExportRequest.php file</p> <p>3. Export ZIP file with user's personal data, using data gathered by WordPress and participating plugins for site owners.(Side menu ->Tools -> Export Personal Data)</p> <p>4. Users can download their private message chat history (Updated premium Private Messaging extension)</p>	<p>1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p> <p>2. WooCommerce GDPR (DSGVO) Data Protection-By codemenschen (https://wordpress.org/plugins/wp-gdpr-data-protection/)</p> <p>3. Wordpress updated version</p> <p>4. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)</p>
Audit log activity	<p>1. Plugin function</p> <ul style="list-style-type: none"> Fully encrypted log to be used in case of a dispute or an audit. (If user still registered to the site go from side menu GDPR->Tools->Audit Log, search for the user's email.) On deletion, each user gets a 	<p>1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p>

6 digit token. If need to reference the log to see consent date or consent withdraw, need the email that this person used to register to the site and their 6-digit token. Without that it's not possible to recover the data.

- log(\$user_id, \$input)
- get_log(\$email, \$token = null)
- export_log(\$user_id, \$token)
- audit_log()

Right to Rectification	<p>1. dataErasureRequest.php file</p> <p>2. Plugin features</p> <ul style="list-style-type: none"> • Users submit request form, (php function <code>gdpr_request_form('rectify')</code> or <code>gdpr_request_form('complaint')</code> / shortcodes <code>[gdpr_request_form type="rectify"]</code> or <code>[gdpr_request_form type="complaint"]</code>). <p>After form submission users receive confirmation email. On confirmation, the request will be added on the respective table. (Side menu GDPR - >Requests) The data controller should fulfill the</p>	<p>1. WooCommerce GDPR (DSGVO) Data Protection-By codemenschen (https://wordpress.org/plugins/wp-gdpr-data-protection/)</p> <p>2. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p>
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request and then click the
“Mark Resolved” button.

Right to erasure/R ight to be Forgotten	<p>1. Anonymizing user data, plugin file-DeleteRequest.php, plugin function anonymiseRequests()</p> <p>2. Plugin function</p> <ul style="list-style-type: none"> Users can remove themselves from the site with a request form (php function <code>gdpr_request_form('delete')/shortcode [gdpr_request_form type="delete"]</code>). After form submission, the user receives confirmation email. On confirmation, user data gets analyzed to check if there is any published content on the site (post or comment). (A) If there isn't, user will be deleted from the site and get confirmation emails. (B) Otherwise, he will be added to a review table on dashboard. (Side menu GDPR->Requests->Erasure tab) On this table, can review all user's content and choose to reassign the content to an admin or anonymize their comments. Anonymizing comments will remove their name, picture and IP address from the comment but 	<p>1. WP GDPR Compliance-By Vans (https://wordpress.org/plugins/wp-gdpr-compliance/)</p> <p>2. GDPR-By Trew Knowledge https://wordpress.org/plugins/gdpr/#description</p> <p>3. Wordpress updated version</p> <p>4. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)</p>
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comment message will remain. Then click on “delete” button and the specific user will be removed from the site.

- delete_user(\$user, \$index)

3. Erase user’s personal data, including data controller by participating plugins for site owners. Email-based method to confirm personal data erasure request (for registered users and commenters) (Side menu -> Tools ->Erase Personal Data)

4. Plugin feature

- Delete/unsubscribe users from your MailChimp list when they delete their account(premium MailChimp extension)
- Enable user deletion tab so users can delete their account (account page)

Privacy preferenc e for cookies	1.	Plugin	function	1. GDPR-By Trew Knowledge
			is_allowed_cookie(\$cookie), checks	(https://wordpress.org/plugins/gdpr/#description)
			if a cookie is allowed or not, works	
			for logged in users and visitors	2. WP GDPR Compliance-By Van
	2.	Plugin	function	Ons
			removeOldConsentCookies()	(https://wordpress.org/plugins/wp-gdpr-compliance/)
	3.	Logged-out commenters choose if they want their name, email address and website to be saved in a cookie.		
				3. Wordpress updated version.

(By default will not be saved)		
Consent managem ent	<p>1. Plugin function</p> <ul style="list-style-type: none"> • After user has been saved to database and assigned a user ID, save_user_consent_on_registration(\$user_id), automatically save the consent to database and log this information to the audit log. • save_consent(\$user_id, \$consent_id), save a user consent to database. • has_consent(\$consent_id), checks if user(logged in and visitor) has given specific consent. <p>Plugin feature</p> <ul style="list-style-type: none"> • Required privacy policy consent that user needs to agree before registering to the site (default) • Can register as many consent options as you would like (Side menu GDPR -> Settings -> Consents -> type name of the consent you want to create and click on “Add Consent”. Can set the consent as required or not.) <p>2. Plugin feature</p>	<p>1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)</p> <p>2. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)</p>

	<ul style="list-style-type: none"> • Private field in registration forms for users to consent to privacy policy before registering (free Terms & Conditions extension) • Recorded timestamp of user confirmation to terms and conditions upon registration(free Terms & Conditions extension) 	
Right to withdraw consent	1. Plugin function <ul style="list-style-type: none"> • <code>remove_consent(\$user_id, \$consent_id)</code>, remove a user consent from the database. • <code>seek_consent()</code> (Remove consent from all users, on next login need to consent again.) 	1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description)
Data minimization	1. Plugin function <code>onlySendEssentialDataDuringUpdate</code> <code>Check(\$query = array())</code>	1. WP GDPR Compliance-By Vans (https://wordpress.org/plugins/wp-gdpr-compliance/)
Privacy policy	1. Plugin function <ul style="list-style-type: none"> • <code>policy_updated_notice()</code> • <code>agree_with_new_policies()</code> • <code>update_privacy_preferences()</code> 2. Privacy Policy page (add a link to your policy to every page on your website) (Automatically created in side menu -> Pages and can be edited	1. GDPR-By Trew Knowledge (https://wordpress.org/plugins/gdpr/#description) 2. Wordpress updated version 3. Ultimate Member – User Profile & Membership Plugin- By Ultimate Member (https://wordpress.org/plugins/ultimate-member/)

from side menu -> Settings -> [ate-member/](#))

Privacy)

3. Create privacy policy and enable the privacy policy field on registration forms (turn on privacy policy from edit registration form page)

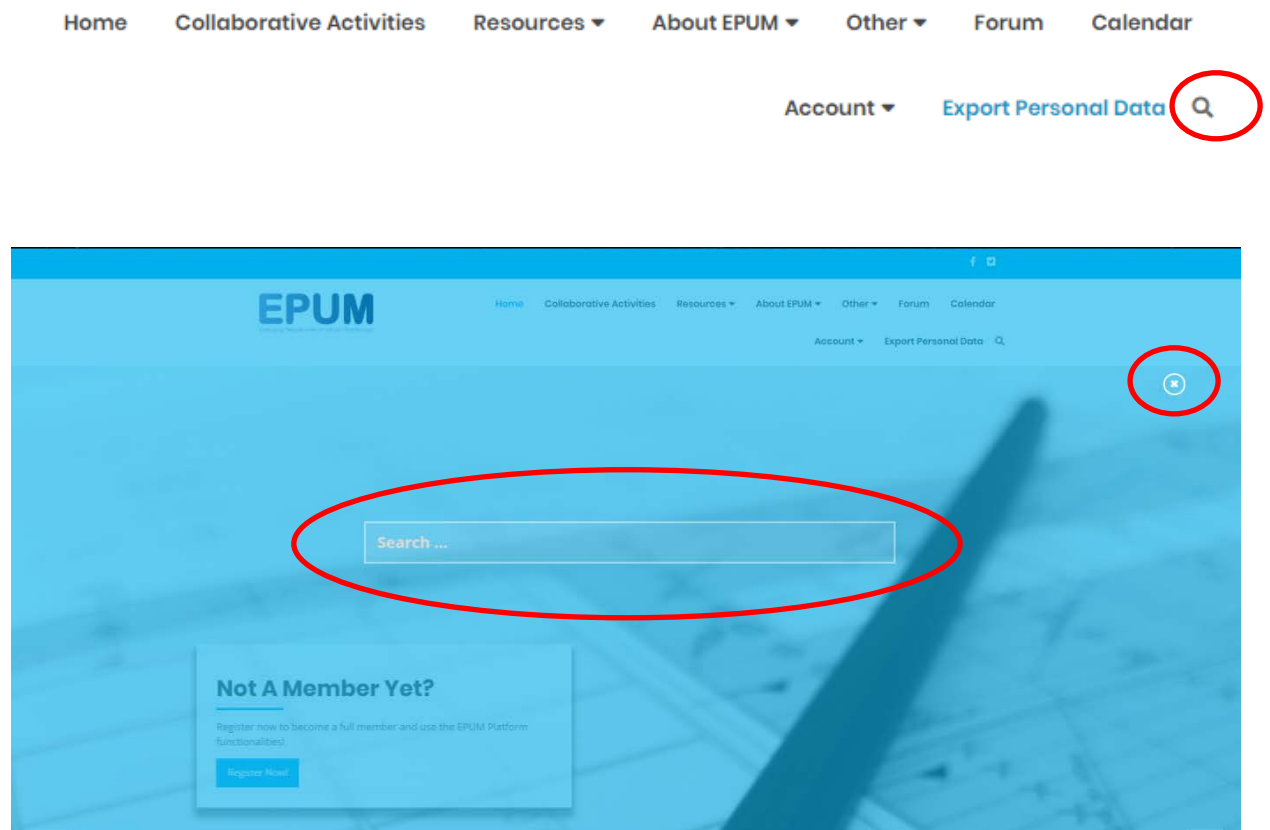
Appendix B

User Manual

1.1 Simple Search

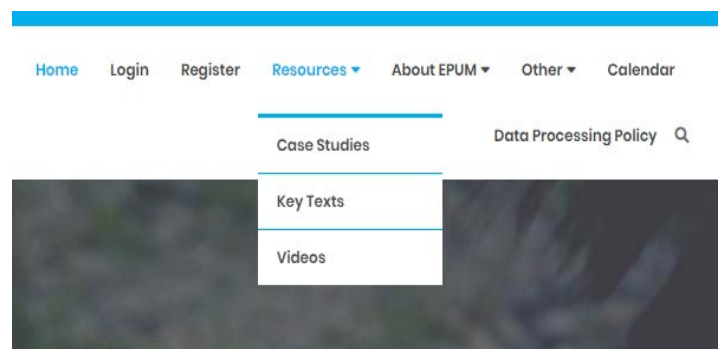
To search for a post:

- Click on the magnifying glass
- Enter the searched text in the field located in the center of the screen
- Press enter



1.2 View Resources

- Hover over the Resources tab
- Select a resource category



Category: CASE STUDIES

[Home](#) > [RESOURCES](#) > [CASE STUDIES](#)

Case Study Test

Posted By  Evangelia Vanezi  March 7, 2019

Case Study Test

Preview case study or key texts.

Category: VIDEOS

[Home](#) > [RESOURCES](#) > [VIDEOS](#)

Video Test

Posted By  Evangelia vanezi  March 7, 2019

Video Test

Video Test

[Home](#) > [VIDEOS](#) > [Video Test](#)

7, Mar  VIDEOS

Video Test

 [Key Text Test](#)

Leave a Reply

Logged in as Evangelia Student. [Log out?](#)

Your Comment:

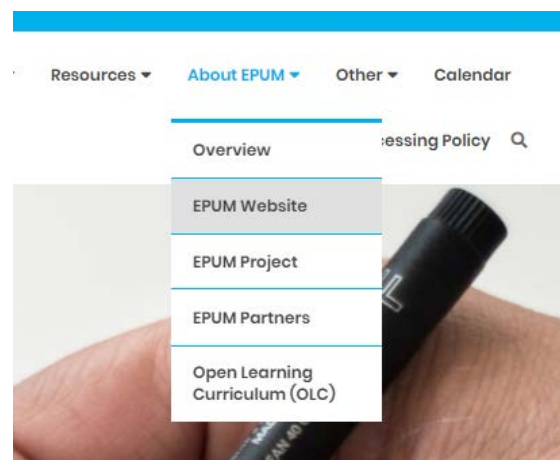
[Post Comment](#)

To preview videos:

- Click on Video's name
- Write comment on the are available
- Click on “Post Comment” button to post your comment
- Click on “Videos” folder to go to the home folder
- Click on arrows to navigate between resources
- Click on “Logged in as Username, Log out?” link to log out

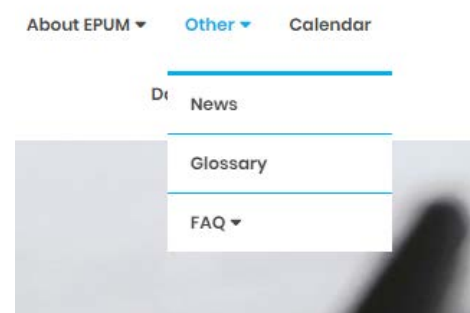
1.3 View Information About EPUM

- Hover over “About EPUM” tab
- Click on the category you want
- Click on “EPUM Website” to view the website
- Click on “EPUM Project” to view details about the project
- Click on “EPUM Partners” to view information about the partners



1.4 View Other material

- Hover over “Other” tab
- Click on the category you want
- Click on “News” to preview the news



1.5 View events on Calendar page

To view all the created events related to EPUM project:

- Click on “Calendar” tab
- Click on “View Event” button on the event you want to view

- View related information
- Click on “Go Back” button

The screenshot shows the EPUM website interface. At the top, the EPUM logo is on the left, and navigation links (Home, Login, Register, Resources, About EPUM, Other, Calendar) are on the right. Below the header is a grey banner with the text 'ALL EVENTS' and a breadcrumb link 'Home > ALL EVENTS'. The main content area displays a grid of event cards. The first card, titled 'Test' (CLA: Test edited) on 16 of March 2019, has its 'VIEW EVENT' button highlighted with a red box. Below this grid is another grey banner with the text 'Event Information' and a breadcrumb link 'Home > ALL EVENTS > Event Information'. The event details page shows the title 'Test' (CLA: Test edited) with a description 'Hi'. The date is '16 of March 2019' and the creator is 'UNKNOWN AUTHOR'. A '< Go Back' button in the top right corner of the event details box is also highlighted with a red box.

1.6 Visit Facebook page

Visit project's facebook page:

- Click on facebook logo

1.7 Visit Twitter page

Visit project's twitter page:

- Click on twitter logo

1.8 Register

To create account:


- Click on "Register" tab
- Fill required form fields
- Click on "Show Privacy Policy"
- Tick the "Please confirm that you agree to our privacy policy"
- Click on "Register" button

Username *

First Name *

Last Name *


E-mail Address *

Password * 

Confirm Password *

Institution/Organization *


Role *

Choose account type 

[Show privacy policy](#)

☐ Please confirm that you agree to our privacy policy

Role *

Choose account type 

Student

Teacher

Special cases:

1.8.1 Required fields are missing

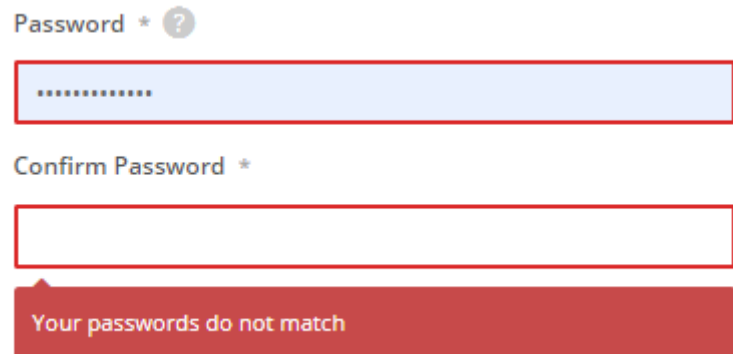
The screenshot shows a registration form with the following fields and their validation status:

- Username ***: The input field contains "TheodoraC". A red error message "Username is required" is displayed below it.
- First Name ***: The input field is empty. A red error message "First Name is required" is displayed below it.
- Last Name ***: The input field is empty. A red error message "Last Name is required" is displayed below it.
- E-mail Address ***: The input field is empty. A red error message "E-mail Address is required" is displayed below it.
- Password *** (with a help icon): The input field contains "*****". A red error message "Password is required" is displayed below it.
- Confirm Password ***: The input field is empty.
- Institution/Organization ***: The input field is empty. A red error message "Institution/Organization is required" is displayed below it.

When the user doesn't fill all the required fields and moves to completion of the registration process then he/she get notified for each field he/she left empty in order to give a value. Afterwards he/she can finish his/her registration.

1.8.2 Password doesn't match

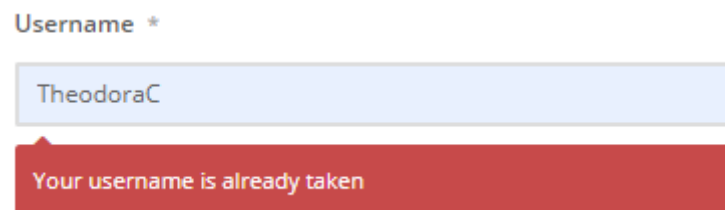
If the user gives different passwords in the field Password and Confirm Password he/she gets the following message.



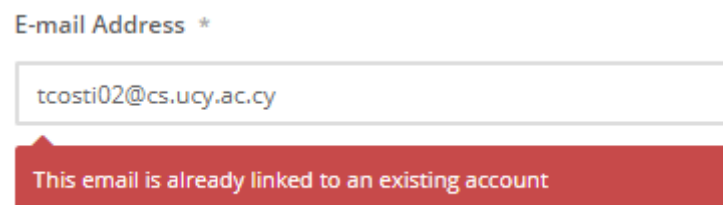
The screenshot shows a web form with two password fields. The first field is labeled "Password *" and contains a series of dots. The second field is labeled "Confirm Password *" and is empty. Below the second field, a red error message box displays the text "Your passwords do not match".

1.8.3 Username or E-mail address already exists

If the user provides the fields Username or/and E-mail Address with values that already exist in the system he/she gets the following message.



The screenshot shows a web form with a single field labeled "Username *" containing the text "TheodoraC". Below the field, a red error message box displays the text "Your username is already taken".



The screenshot shows a web form with a single field labeled "E-mail Address *" containing the text "tcosti02@cs.ucy.ac.cy". Below the field, a red error message box displays the text "This email is already linked to an existing account".

1.8.4 User don't agree with privacy policy

If the user doesn't click on the confirmation check box of the privacy policy, he/she gets the following message.

[Show privacy policy](#)

☐ Please confirm that you agree to our privacy policy

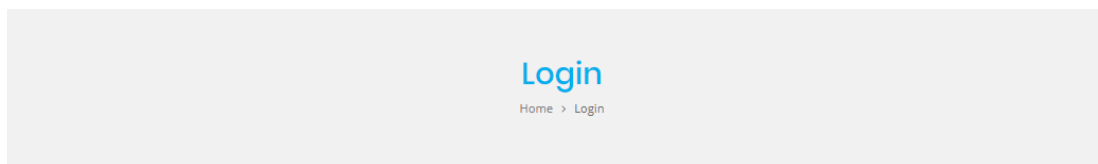
Please confirm your acceptance of our privacy policy



1.9 Login

To login to your account:

- Click on “Login” tab
- Fill the login form with your credentials
- Click on “Keep me signed in” to keep saved your credentials
- Click on “Login” button



*In case your account is restricted you won't be able to login in your account, unless you unrestrict it.

Username or E-mail *

Password *

☐ Keep me signed in

Login

Register

[Forgot your password?](#)

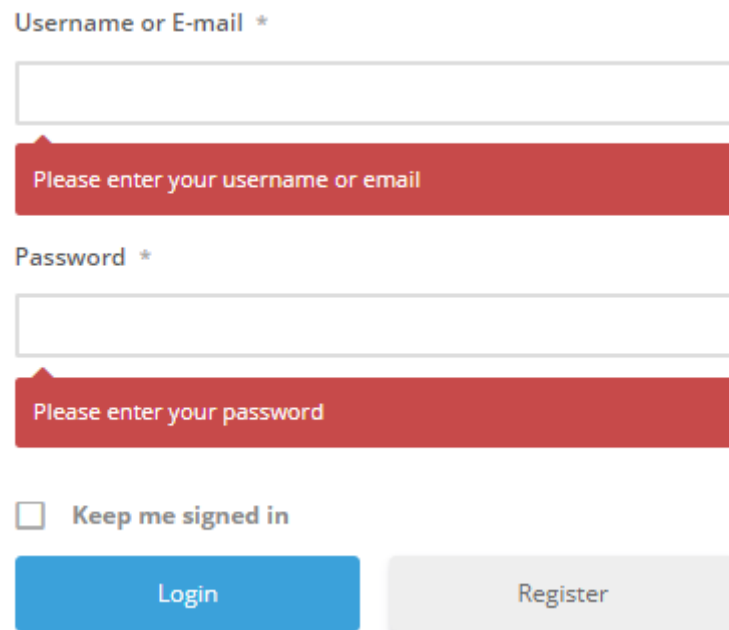
[Restricted Account? Click here to unrestrict!](#)

Because of restriction your account has been anonymized , we keep storing all of your account data but you aren't able to process it. In order to revert from restriction click the above button.

Special cases:

1.9.1 Required fields are missing

When the user doesn't fill all the required fields and moves to completion of the login process then he/she get notified for each field he/she left empty in order to give a value. Afterwards he/she can finish his/her login.



The image shows a login form with two input fields. The first field is labeled 'Username or E-mail *' and is empty. Below it is a red error message box that says 'Please enter your username or email'. The second field is labeled 'Password *' and is also empty. Below it is another red error message box that says 'Please enter your password'. Below the password field is a checkbox labeled 'Keep me signed in'. At the bottom of the form are two buttons: a blue 'Login' button and a grey 'Register' button.

Username or E-mail *

Please enter your username or email

Password *

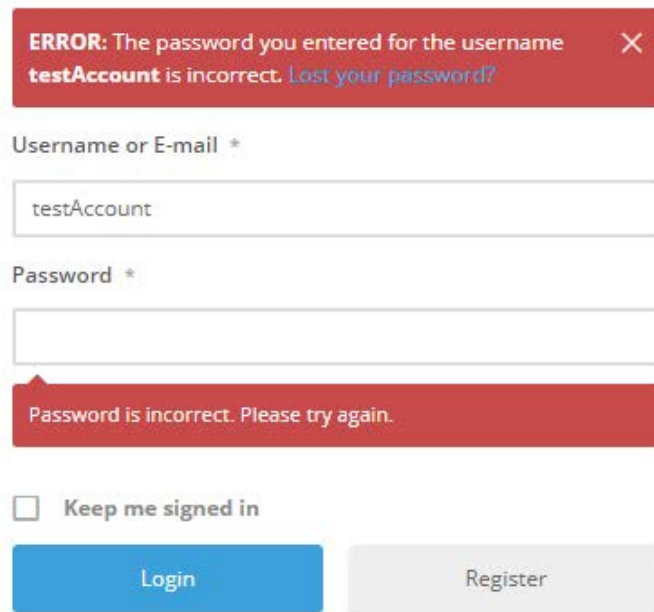
Please enter your password

☐ Keep me signed in

Login Register

1.9.2 Incorrect password

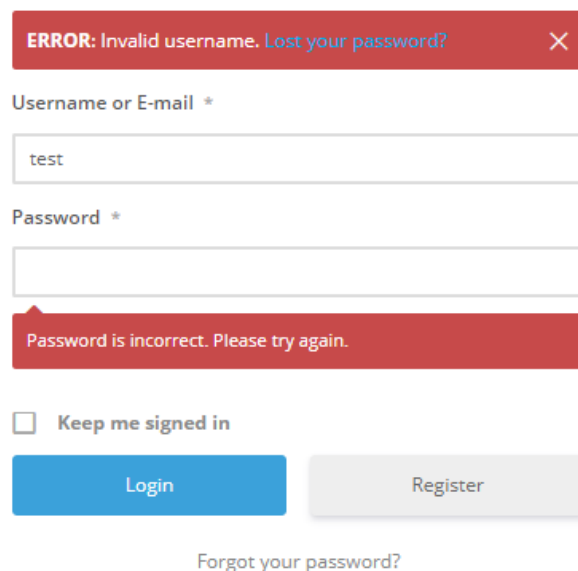
When the user enters an incorrect password for his/her account login, he/she gets the following message.



The screenshot shows a login form with a red error message at the top: "ERROR: The password you entered for the username testAccount is incorrect. [Lost your password?](#)". Below this, the "Username or E-mail" field contains "testAccount". The "Password" field is empty. A red tooltip points to the password field with the message "Password is incorrect. Please try again.". At the bottom, there is a checkbox for "Keep me signed in", a blue "Login" button, and a grey "Register" button.

1.9.3 Incorrect username

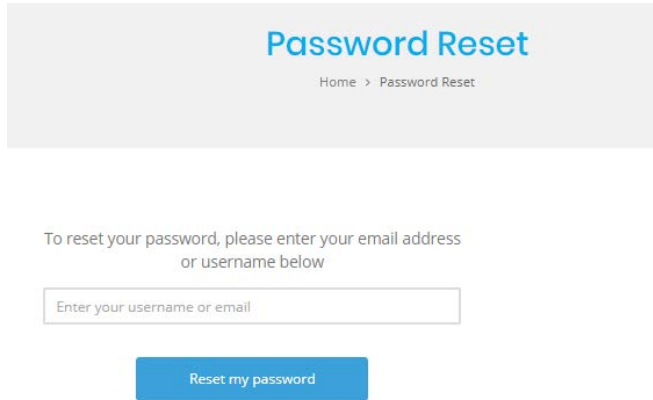
When the user enters an incorrect username for his/her login account, he/she gets the following message.



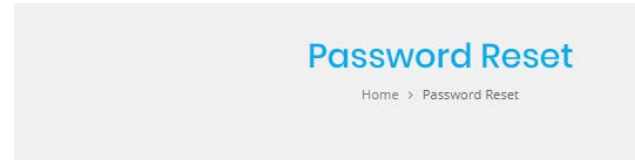
The screenshot shows the same login form, but the "Username or E-mail" field now contains "test". The red error message at the top reads: "ERROR: Invalid username. [Lost your password?](#)". The "Password" field remains empty. The red tooltip still points to the password field with the message "Password is incorrect. Please try again.". At the bottom, there is a checkbox for "Keep me signed in", a blue "Login" button, and a grey "Register" button. A link "Forgot your password?" is visible below the "Register" button.

1.9.4 Forgot your password

When the user has forgotten his/her password clicks on the indicated text to view the following form in order to reset his password.

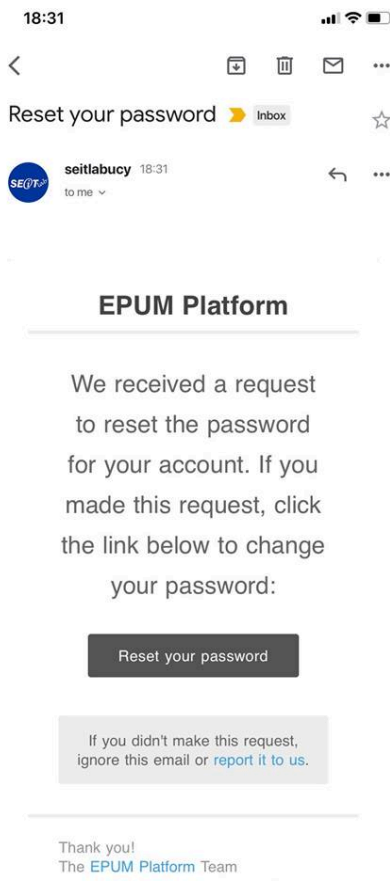


The screenshot shows a web page titled "Password Reset" with a breadcrumb "Home > Password Reset". Below the title, it says "To reset your password, please enter your email address or username below". There is a text input field with the placeholder "Enter your username or email". Below the input field is a blue button labeled "Reset my password".

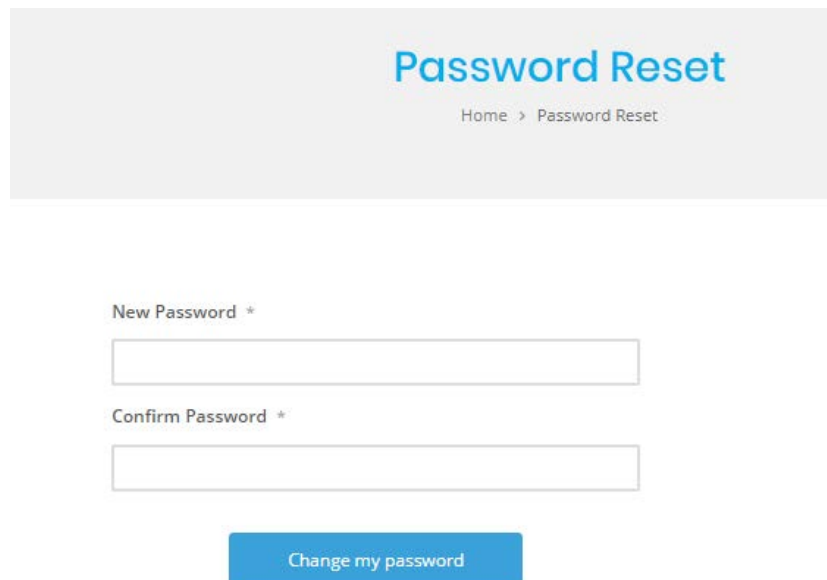


The screenshot shows a web page titled "Password Reset" with a breadcrumb "Home > Password Reset". Below the title, it says "We have sent you a password reset link to your e-mail. Please check your inbox."

After the user enters his/her username or email and clicks on the Reset my password button, he/she will receive the following email. The user clicks on the Reset your password button to transfer him/her to Password Reset page.

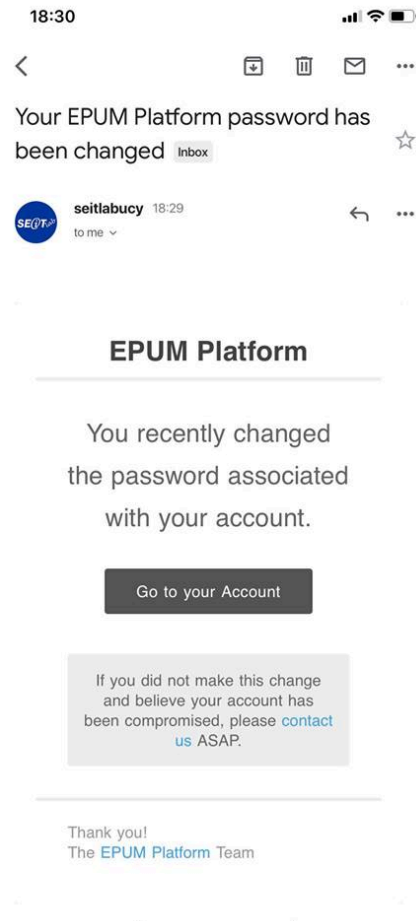


The screenshot shows an email interface. At the top, it says "18:31" and shows signal and battery icons. Below, there's a back arrow, a plus icon, a trash icon, an envelope icon, and a three-dot menu. The email title is "Reset your password" with a yellow envelope icon and "Inbox" label. The sender is "seitlabucy" with a blue circular profile picture and "18:31 to me" below it. The email body starts with "EPUM Platform" followed by a horizontal line. The text says "We received a request to reset the password for your account. If you made this request, click the link below to change your password:". Below this is a dark grey button labeled "Reset your password". At the bottom, there's a grey box with the text "If you didn't make this request, ignore this email or [report it to us](#)." and a "Thank you! The EPUM Platform Team" signature.



The screenshot shows a web page titled "Password Reset" with a breadcrumb "Home > Password Reset". Below the title, there are two text input fields. The first is labeled "New Password *" and the second is labeled "Confirm Password *". Below the input fields is a blue button labeled "Change my password".

The user needs to provide a new password and then click on the Change my password button in order for the change to be done. After the change the user receives the following message.

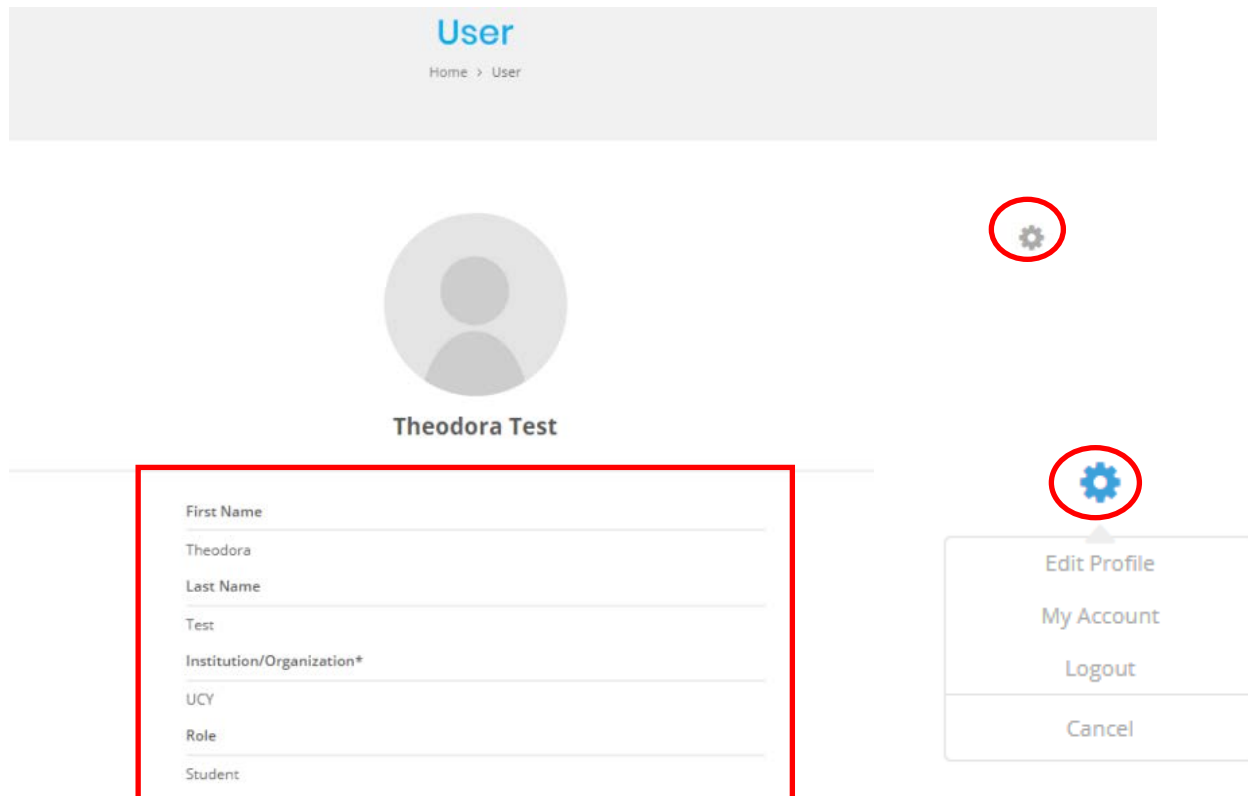


1.10 Manage Account

1.10.1 My Profile

To manage your account settings and information:

- Click on the gear icon.
- Click on the action you want to proceed





The image shows a user profile management interface. At the top, there is a header bar with the word "User" in blue and a breadcrumb "Home > User". Below this, there is a large grey circle representing a profile picture, with the name "Theodora Test" underneath it. To the right of the profile picture, there is a small gear icon circled in red. Below the profile picture, there is a form with several input fields, each with a label and a value: "First Name" (Theodora), "Last Name" (Test), "Institution/Organization*" (UCY), "Role" (Student). To the right of the form, there is a menu with a gear icon circled in red, and the following options: "Edit Profile", "My Account", "Logout", and "Cancel".

Field	Value
First Name	Theodora
Last Name	Test
Institution/Organization*	UCY
Role	Student

- Edit Profile
- My Account
- Logout
- Cancel

Edit Profile

If the user clicks on Edit Profile option then the following form is presented to him/her.



Theodora Test

First Name

Last Name

Institution/Organization* *

Role *

Student

▼

Update Profile


Cancel

1.10.2 My Account

- Clicks on “My Account” tab
- Change your data
- Click on the “Update Account” button to save the new data.
- Click on “View profile” text to transfer to your profile page.


Account


Home > Account




Theodora Test

[View profile](#)

 Account >

 Change Password >

 Delete Account >

Account

Username *

First Name

Last Name

E-mail Address

Update Account

Your account was updated successfully.

Account

Username *

testAccount

To change your password:

- Click on the “Change Password” tab
- Submit the form
- Click on the “Update Password” button

Account

Home > Account

Theodora Test

View profile

Account

Change Password

Delete Account

Current Password *

New Password *

Confirm Password *

Update Password

Your account was updated successfully.

Change Password

Current Password *

New Password *

Current Password *

This is not your password

New Password *

Your new password does not match

Confirm Password *

Your passwords do not match

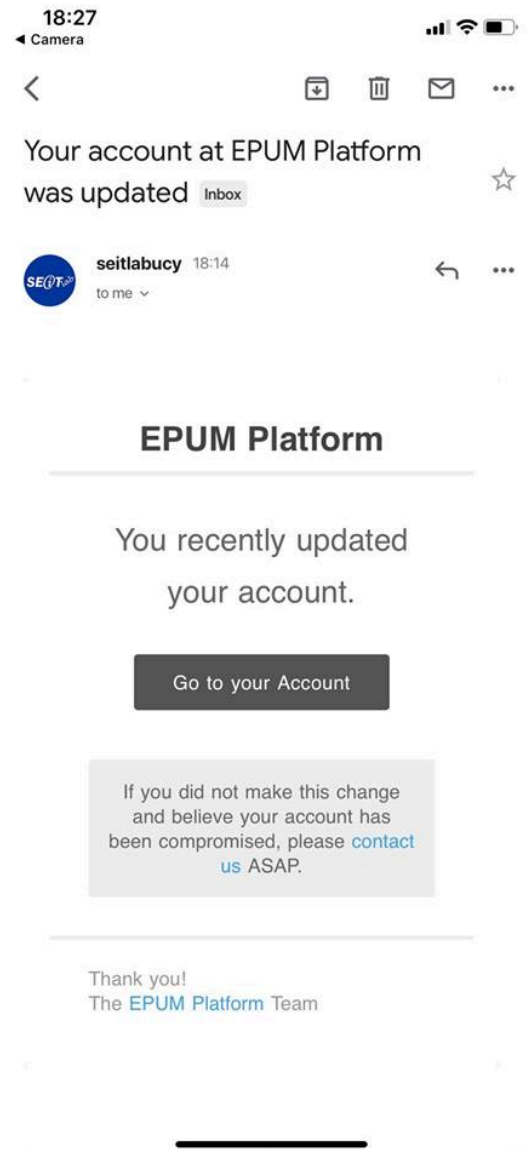
Update Password

New Password *

You must enter a new password


Confirm Password *

You must confirm your new password





To delete your account:


- Click on the “Delete Account” tab
- Fill the form fields
- Click on the “Delete Account” button




Theodora Test
[View profile](#)

 Account >

 Change Password >

 Delete Account >

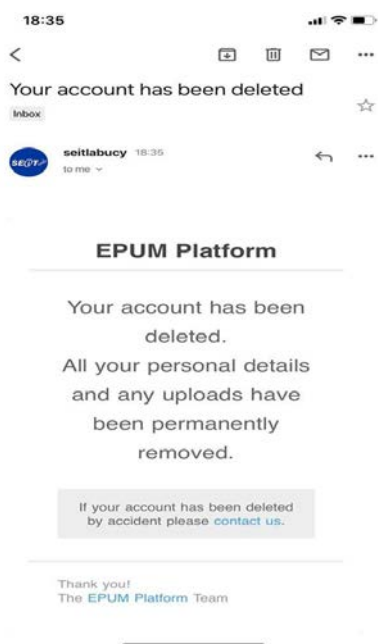
 **Delete Account**

Are you sure you want to delete your account? This will erase all of your account data from the site. To delete your account enter your password below

Password *

Delete Account

If the user completes his/her account deletion he/she receives the following email.



below

Password *

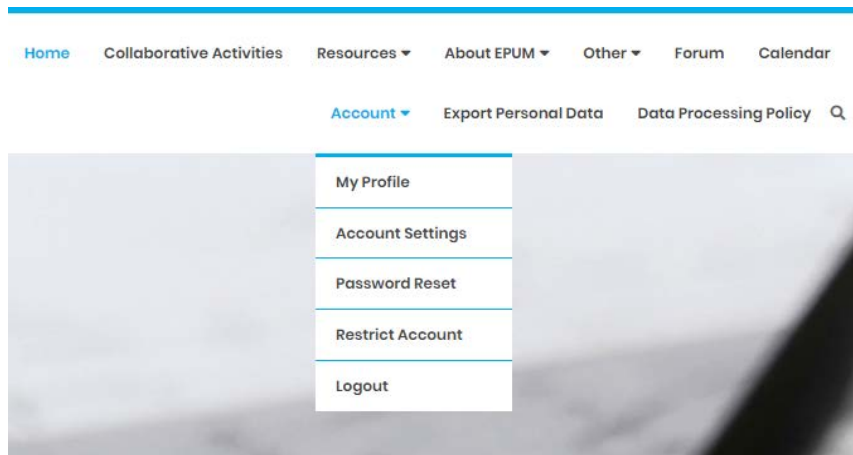
This is not your password

Delete Account

1.10.3 Password Reset

To reset your account:

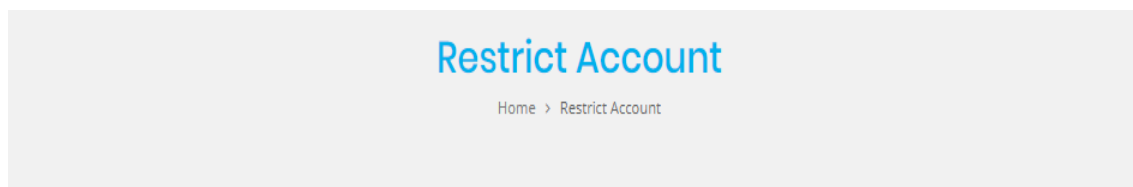
- Click on the “Password Reset”



1.10.4 Restrict Account

To restrict your account:

- Click on the “Restrict Account” tab
- Click on the “Restrict Account” button
- Click the “OK” button to confirm your action

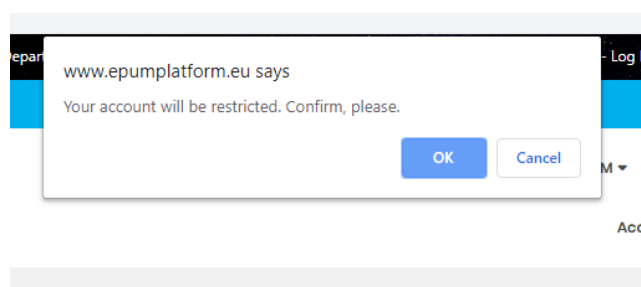


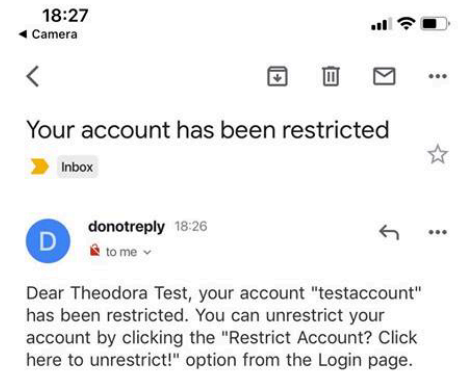
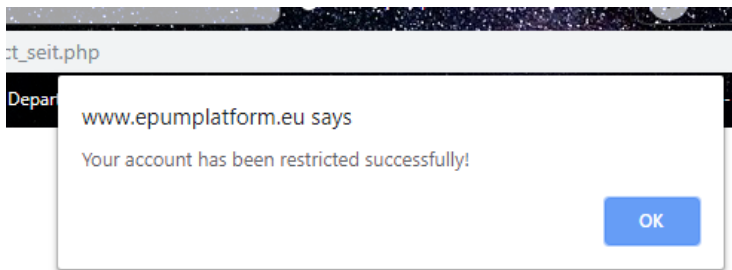
"Article 18 of the GDPR gives individuals the right to restrict the processing of their personal data in certain circumstances. This means that an individual can limit the way that an organisation uses their data. This is an alternative to requesting the erasure of their data."

This will anonymize your account, we will keep storing all of your account data but we won't be able to process it.

To restrict your account click the button below.

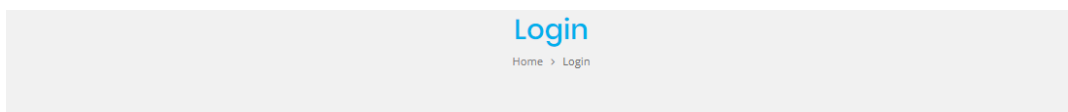
Restrict Account





To login to your account after restriction:

- Click on “Login” tab
- Click on “Restricted Account? Click here to unrestrict!” button
- Fill the form fields
- Click on “Unrestrict Account” button
- Continue with login process



*In case your account is restricted you won't be able to login in your account, unless you unrestrict it.

Username or E-mail *

Password *

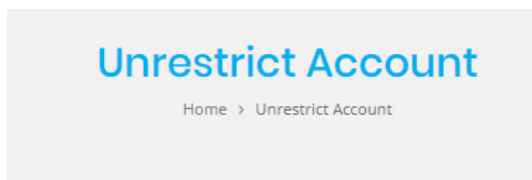
☐ Keep me signed in

[Login](#) [Register](#)

[Forgot your password?](#)

[Restricted Account? Click here to unrestrict!](#)

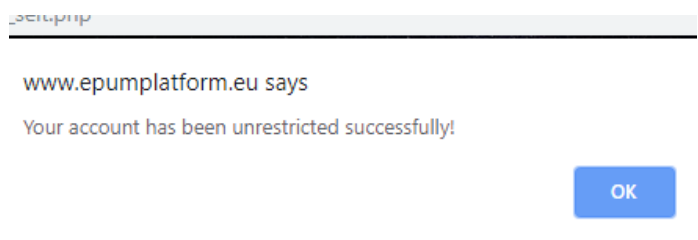
Because of restriction your account has been anonymized , we keep storing all of your account data but you aren't able to process it. In order to revert from restriction click the above button.

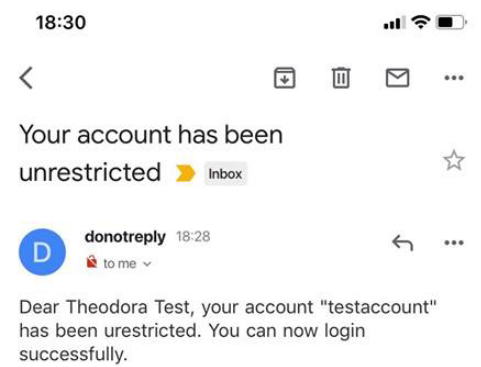
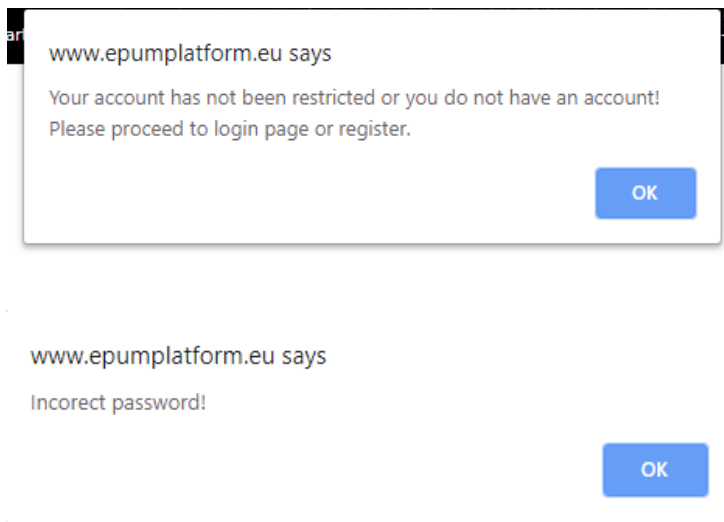


Username:

Password:

[Unrestrict Account](#)





1.11 Use Forum

To use forum:

- Click on “Forum” tab
- Create new topic on specified area
- Post your topic

1.12 Collaborative Activities functionality

To use Collaborative Learning Activities as a teacher:

- Click on the “Collaborative Activities” tab
- Click on “+ Create new CLA” button
- Fill form fields
- Click on “Create CLA” button

My CLAs

[+ Create new CLA](#)

test for anonym

No description
Author:Theodora Test

[VIEW CLA](#)

All CLAs

CLA1

No description
Author:Theodora Costi

CLA2

CLA2 descr
Author:Theodora Costi

CLA3

aaaaa
Author:Theodora Costi

Create CLA

[Home](#) > [Collaborative Activities](#) > [Create CLA](#)

[< Go Back](#)

CLA Title

Description

Brief

Your file:

No file chosen

[Create CLA](#)[Reset](#)

To create Resource:

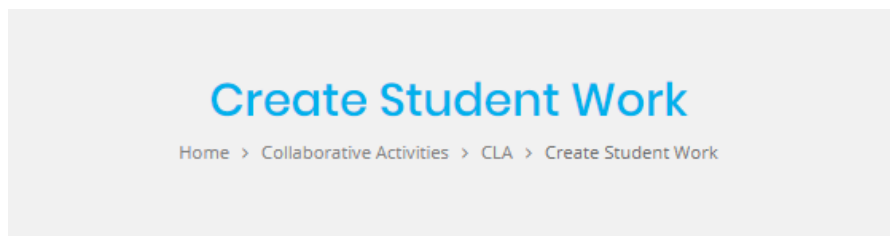
- Click on “View” button of a CLA
- Click on “+Create new Resource” button
- Fill form fields
- Click on “Create Resource” button

To create Event:

- Click on “View” button of a CLA
- Click on “+Create new Event” button
- Fill form fields
- Click on “Create Event” button

To create Student Work:

- Click on “View” button of a CLA
- Click on “+Create new Student Work” button
- Fill form fields
- Click on “Create Student Work” button

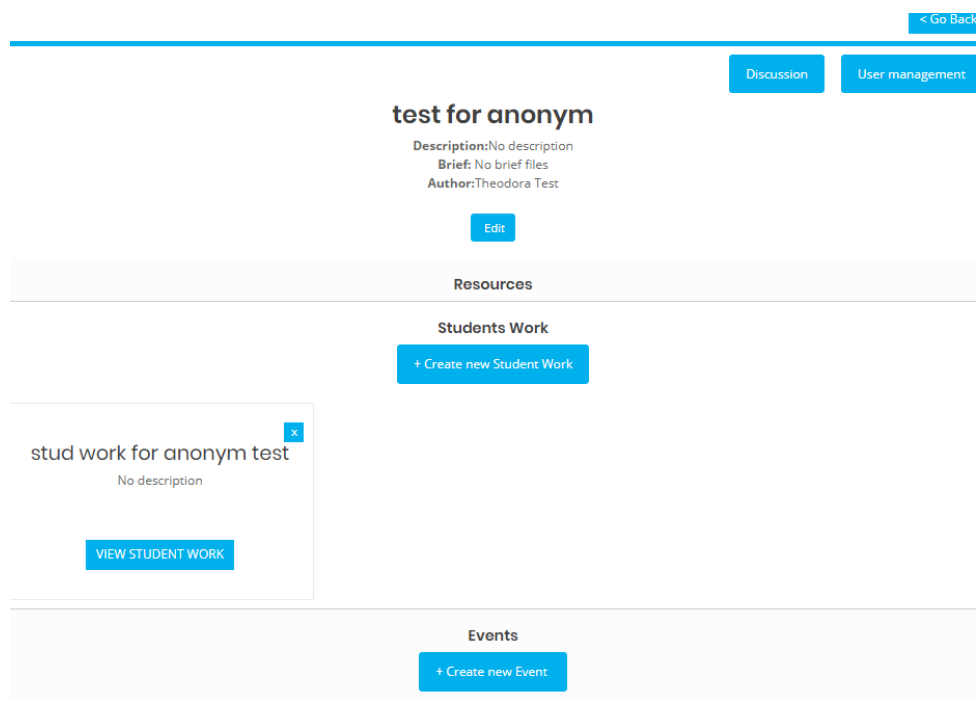
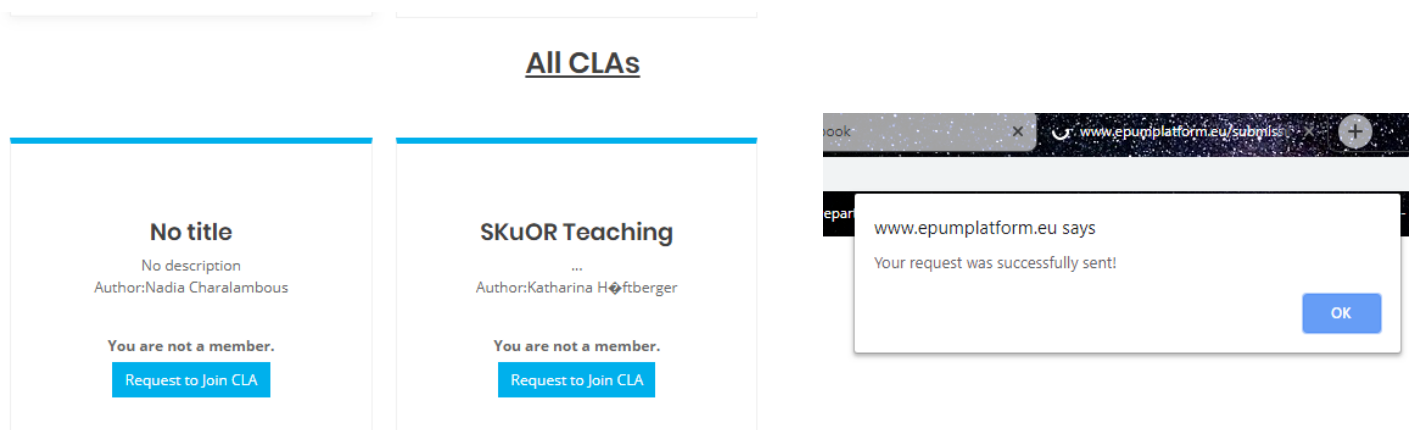
A screenshot of a web form for creating student work. At the top right is a blue button with white text that says '< Go Back'. Below this, the form has three main sections. The first section is labeled 'Title' and contains a text input field with the placeholder text 'Please provide a title for the new student work'. The second section is labeled 'Description' and contains a larger text input field with the placeholder text 'Please enter a description for the new student work'. The third section is labeled 'Your file:' and contains a 'Choose File' button, followed by the text 'No file chosen'. At the bottom of the form are two blue buttons: 'Create student work' and 'Reset'.

To access unauthorized CLAs:

- Click on “Request to Join CLA” button

To assign/remove members to CLA:

- Click on “Add/Remove CLA Users”
- Select member
- Click on “Proceed” button



To edit CLA:

- Click on “View CLA” button
- Click on “Edit” button
- Change form values
- Click on “Submit Changes” button

The screenshot shows a web interface for editing a CLA. At the top right is a blue button labeled "< Go Back". Below it are two blue buttons: "Discussion" and "User management". The main form area contains the following fields and controls:

- CLA Title:** A text input field containing "test for anonym".
- CLA Description:** A text input field containing "No description".
- Brief: No brief files:** A section with a "Choose File" button and the text "No file chosen".
- Author:** A text field containing "Theodora Test".
- At the bottom of the form are two blue buttons: "Submit changes" and "Cancel Editing".

Below the form is a section titled "Resources" with a sub-section "Students Work" containing a blue button "+ Create new Student Work".

To edit Resource/Student Work/Event:

- Click on “View CLA” button
- Click on “View Resource/Student Work/Event” button
- Click on “Edit” button
- Change form values
- Click on “Submit Changes” button

To start CLA discussion:

- Click on “View CLA” button
- Click on “Discussion” button
- Write message on available area
- Click on “Send Message” button

CLA discussion

Home > Collaborative Activities > CLA > CLA discussion

There are 2 messages in this discussion

Theodora Test(student)

2019-04-18 10:40:04 (CET time)

test discussion for anonym

Theodora Test(student)

2019-04-18 10:45:08 (CET time)

new

< Go Back to CLA

ADD A REPLY

<Please add a Message>

Send Message

Start a student work peer review:

- Click on “View CLA” button
- Click on “View Student Work” button
- Write review on available area
- Click on “Post Comment” button

Student Work

Home > Collaborative Activities > CLA > Student Work

stud work for anonym test

Description: No description

File: No files

Author: Theodora Test

Peer Review

Theodora Test(student)

2019-04-18 10:36:34 (CET time)

test msg

There are 1 messages in this discussion

ADD A REPLY

<Please add a Comment>

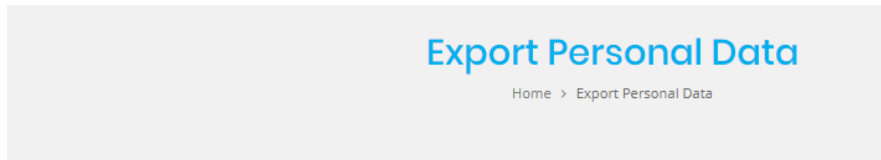
Post Comment

< Go Back

1.13 Export Personal Data

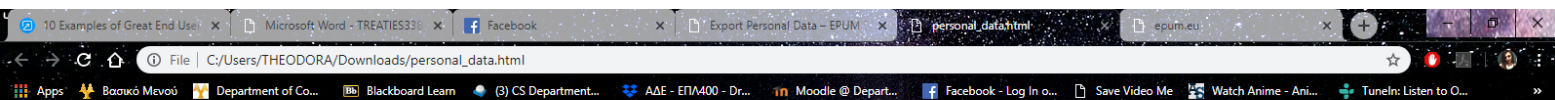
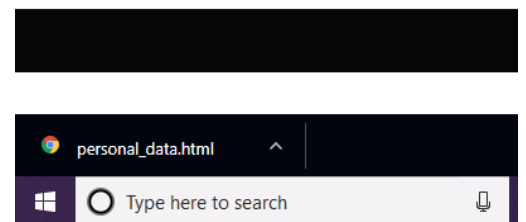
To export your personal data:

- Click on “Export Personal Data” tab
- Click on “Export Personal Data” button
- Open downloaded file



You can download all your personal data formatted as a table for viewing.

Export Personal Data



User Information

User Login	User Password	Username	Email	User Url	User Registration (Date & Time)	User Activation Key	User Status	User Display Name
testAccount	\$P\$BWWJ9ew7EA.GJkNaW.aCrPdahlIip0	testaccount	christie.kosti@gmail.com		2019-04-09 14:50:22	1557069273:\$P\$BS73W65YJT2Z4HuXhxHBY.8G6Xzm6v.	0	Theodora Test

User Meta Data

Meta Key	Meta Value
nickname	testAccount
first_name	Theodora
last_name	Test
description	
rich_editing	true
syntax_highlighting	true
comment_shortcuts	false
admin_color	fresh
use_ssl	0
show_admin_bar_front	true
locale	
wp_capabilities	a:1:{s:10:"um_student";b:1;}
wp_user_level	0

1.14 View Data Processing Privacy Policy

- Click on “Data Processing Privacy Policy.”

Appendix C

Questionnaire

EPUM Platform Questionnaire

Hello and thank you for taking the time to answer some questions on the EPUM platform usage.

Informed Consent Form

This survey does not have any commercial purposes, the involved researchers do not have any monetary benefits by conducting it and the results will be published in the form of reports and research papers based on the survey. We will not ask you to provide personally sensitive data in this survey. All information collected via this survey will be kept confidential. The confidentiality of the information will be safeguarded subject to any legal requirements; All data will be password protected and accessible only by the named researchers.

By responding to this questionnaire, you confirm the following:

- I have read and understood the purpose of the survey.
- I understand that my taking part is voluntary. I can withdraw from the study at any time during the survey and I do not have to give any reasons for why I no longer want to take part.
- I agree that the answers I give will be stored in digital form. Only the involved researchers will have access to this information and this information will not be distributed to an other person or entity.

If you have any comments or questions, please contact the persons responsible:

Ms. Theodora Costi, University of Cyprus, Cyprus (tcosti02@cs.ucy.ac.cy).

Dr. Georgia Kapitsaki, University of Cyprus, Cyprus (gkapi@cs.ucy.ac.cy).

Gender

Choose ▼

Age (please specify)

Your answer _____

Country

- ☐ Cyprus
- ☐ Portugal
- ☐ Italy
- ☐ Austria
- ☐ England
- ☐ Other: _____

What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.

Choose



How would you rate your own computer literacy?

	1	2	3	4	5	
Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Excellent

How would you rate your overall expertise with e-learning platforms?

- ☐ No experience
- ☐ Novice
- ☐ Intermediate
- ☐ Advanced
- ☐ Expert

Rate from 1 to 5 how much you would like to collaborate online with other students to complete learning activities?

	1	2	3	4	5	
Not at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very much

How would you rate your overall expertise with online collaborative learning activities?

- ☐ No experience
- ☐ Novice
- ☐ Intermediate
- ☐ Advanced

☐ Expert

NEXT

EPUM Platform Questionnaire

GDPR related questions

1. Rate the level of difficulty in locating the privacy policy of the platform.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

2. How unclear(1) or clear(5) is, in the privacy policy, the purpose of collecting and processing your data.

	1	2	3	4	5	
Not clear at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very clear

3. How many are the required fields in the registration form?

- ☐ All fields are required
- ☐ None of the fields are required
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6

4. Which of the following required fields you would prefer not to fill?

- ☐ Username
- ☐ First Name
- ☐ Last Name
- ☐ E-mail Address
- ☐ Password
- ☐ Institution/Organization
- ☐ Role
- ☐ None
- ☐ All

5. Rate the level of difficulty in locating the area where you can edit your account details.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

6. Rate the level of difficulty in editing your personal data.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

7. After having read the privacy policy, how long will your personal data be kept in the system?

- ☐ 1 year
- ☐ 2 years
- ☐ As long as the system keeps running (system lifetime)
- ☐ As long as you have an account in the platform
- ☐ I don't know

8. How unclear(1) or clear(5) is the time period that the system is going to store your personal data.

	1	2	3	4	5	
Not clear at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very clear

9. Before creating an account on the platform, did the system ask for your agreement on privacy policy?

- ☐ Yes
- ☐ No
- ☐ I am not sure

10. How unclear(1) or clear(5) is it to you that after you delete or restrict your account you withdraw your consent?

	1	2	3	4	5	
Not clear at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very clear

11. Rate the level of difficulty locating the delete account property.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

12. Rate the level of difficulty in locating the restrict account property?

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

13. If you were to delete or restrict your account what actions of the following do you expect to happen (can choose more than one)?

	Delete account	Restrict account
Delete all your personal data from the system	<input type="checkbox"/>	<input type="checkbox"/>
The system stops processing your personal data	<input type="checkbox"/>	<input type="checkbox"/>
Reactivate your account	<input type="checkbox"/>	<input type="checkbox"/>

14. Rate the level of usefulness of the restrict account property.

	1	2	3	4	5	
Not useful at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very useful

15. Rate the level of difficulty in locating the export personal data page.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

16. Rate your level of interest for exporting your personal data.

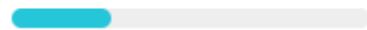
	1	2	3	4	5	
Not interested at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very interested

17. After exporting your personal data, rate the level of your understanding of the format.

	1	2	3	4	5	
Not understandable at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very understandable

BACK

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Page 2 of 7

Collaborative Learning Activities functionality

1. Rate the level of difficulty in requesting to join to CLAs that you are not a member of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

2. Rate the level of difficulty in starting a discussion in the CLAs that you are a member of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

3. Rate the level of understanding in identifying the CLAs that you are a member of.

	1	2	3	4	5	
Not understandable at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very understandable

4. Rate the level of understanding in identifying the CLAs that you are the author of.

1 2 3 4 5

Not understandable at all ☐ ☐ ☐ ☐ ☐ Very understandable

5. Rate the level of difficulty in viewing the members of the CLAs that you are assigned to.

1 2 3 4 5

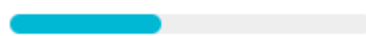
Very difficult ☐ ☐ ☐ ☐ ☐ Very easy

6. Choose your role. *

Choose ▼

BACK

NEXT

 Page 3 of 7

Teacher Resources

1. Rate the level of difficulty in creating a new Collaborative Learning Activity (CLA).

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

2. Rate the level of difficulty in editing the CLAs you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

3. Rate the level of difficulty in assigning members to your CLAs.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

4. Rate the level of difficulty in creating a new resource.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

5. Rate the level of difficulty in editing the resources you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

6. Rate the level of difficulty in viewing the information of the resources of the CLAs that you are member/author of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

7. Rate the level of difficulty in deleting the resources that you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

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Student Works

1. Rate the level of difficulty in creating a new student work.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

2. Rate the level of difficulty in editing the student work you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

3. Rate the level of difficulty in viewing the information of the student work of the CLAs that you are member/author of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

4. Rate the level of difficulty in deleting the student works that you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

Epum platform functionalities

1. Rate the level of difficulty in starting a peer review of a student work in the CLAs that you are a member of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

2. Rate the level of difficulty in creating a new event.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

3. Rate the level of difficulty in editing the event you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

4. Rate the level of difficulty in viewing the information of the event of the CLAs that you are member/author of.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

5. Rate the level of difficulty in deleting the event that you have created.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

6. Rate the level of difficulty in locating the calendar page with all the events.

	1	2	3	4	5	
Very difficult	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very easy

7. Rate the level of usefulness of the following functionalities.

	Not useful at all	Slightly useful	Moderately useful	Very useful	Extremely useful
Start a peer review of a student work in the CLAs that you are a member of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create a new event	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Edit an event you have created	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delete an event that you have created	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have a general calendar page with all the events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create a new CLA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Edit a CLA you have created	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assign members to your CLAs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Request to join to CLAs that you are not a member of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Start a discussion in the CLAs that you are a member of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
View the members of the CLAs that you are assigned to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create a new student work (only if you have student role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create a new resource (only if you have teacher role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Edit a student work you have created (only if you have student role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Edit a resource you have created (only if you have teacher role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delete a student work that you have created (only if you have student role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delete a resource that you have created (only if you have teacher role)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Usability and Learning questions

1. I think that I would like to use this platform frequently.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

2. I find this platform unnecessarily complex.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

3. I think this platform is easy to use.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

4. I think that I would need assistance to be able to use this platform.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

5. I find the various functions in this platform well integrated.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

6. I think there is too much inconsistency in this platform.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

7. I would imagine that most people would learn to use this platform very quickly.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

8. I find this platform very cumbersome/awkward to use.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

9. I feel very confident using this platform.

	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

10. I need to learn a lot of things before I can get going with this platform.

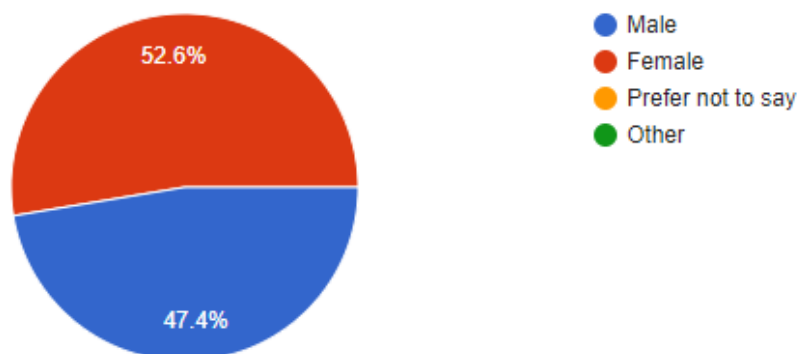
	1	2	3	4	5	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

Questionnaire Results

Section 1 – Demographic Questions

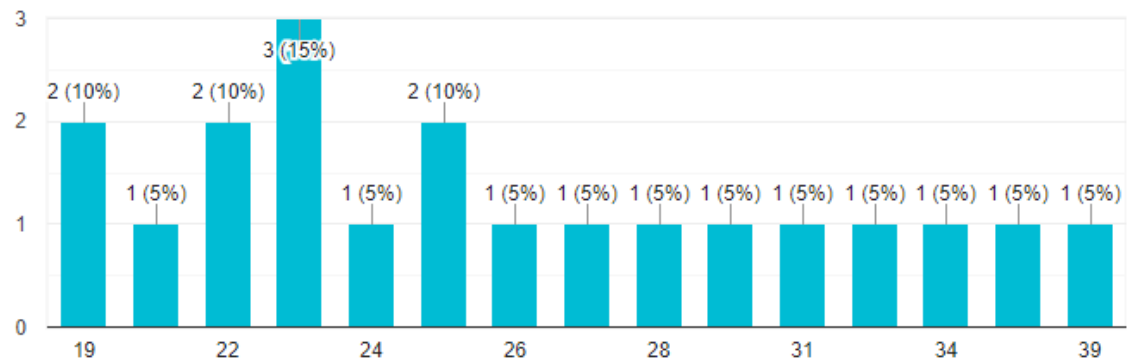
Gender

19 responses



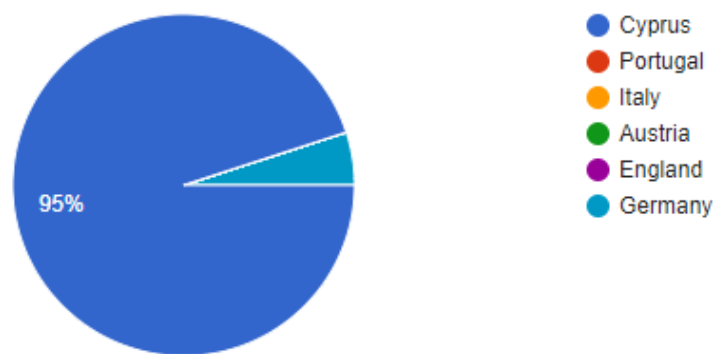
Age (please specify)

20 responses



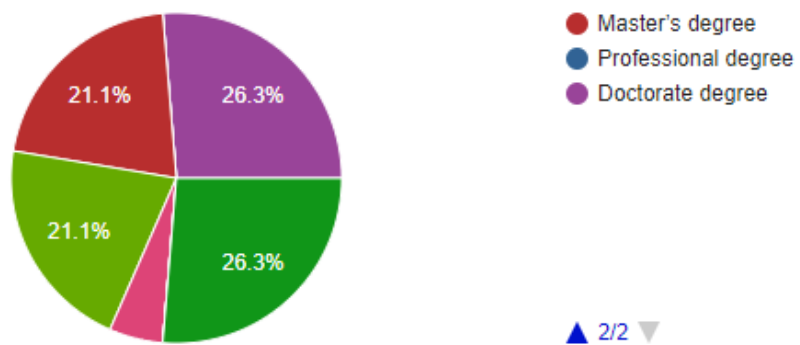
Country

20 responses



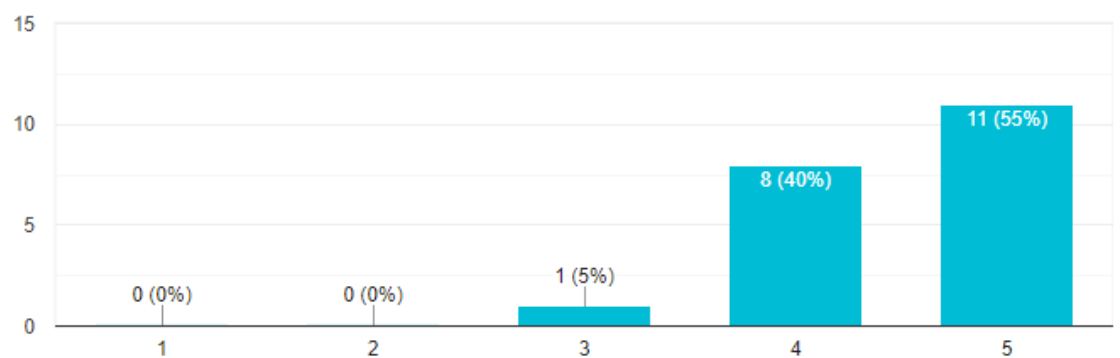
What is the highest degree or level of school you have completed? If currently enrolled, highest degree received.

19 responses



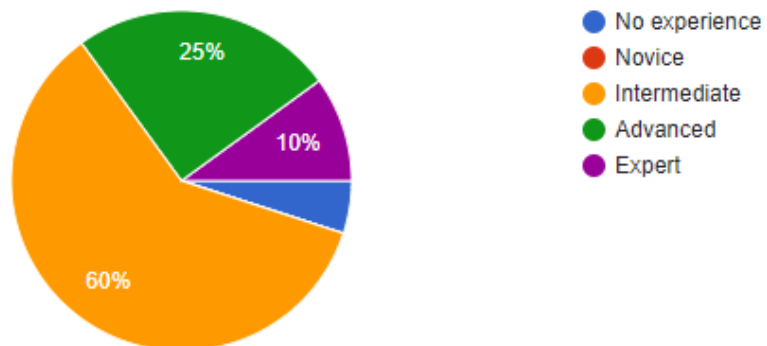
How would you rate your own computer literacy?

20 responses



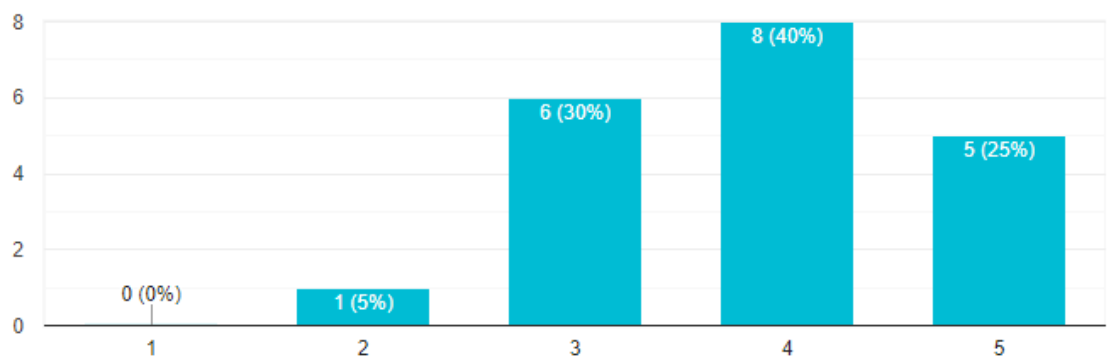
How would you rate your overall expertise with e-learning platforms?

20 responses



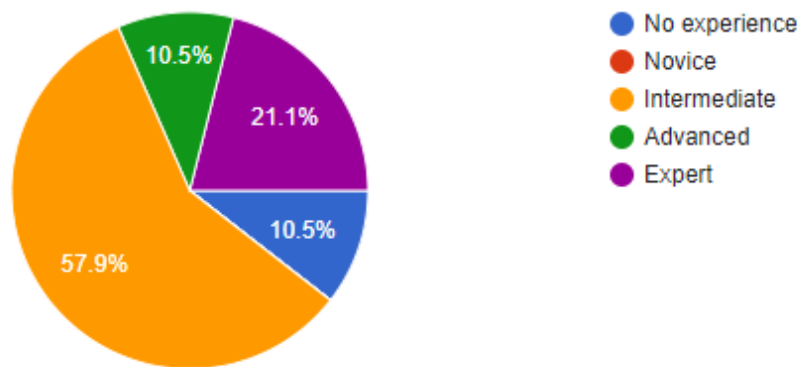
Rate from 1 to 5 how much you would like to collaborate online with other students to complete learning activities?

20 responses



How would you rate your overall expertise with online collaborative learning activities?

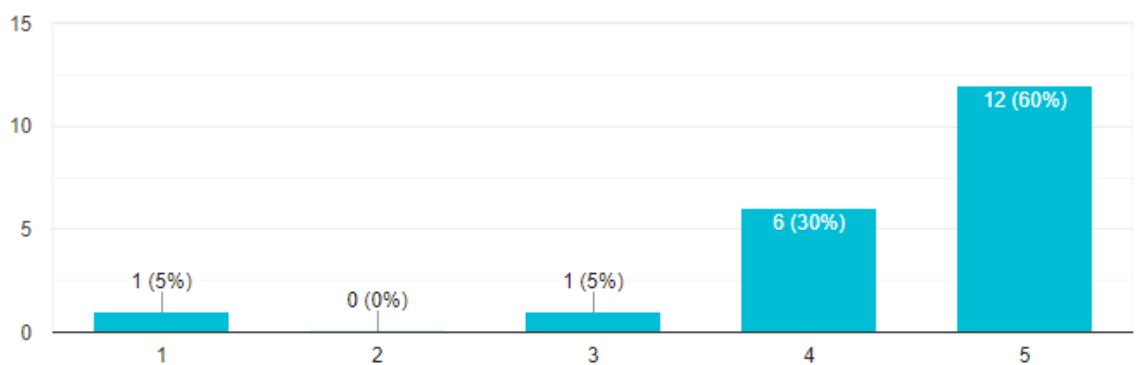
19 responses



Section 2 – GDPR Related Questions

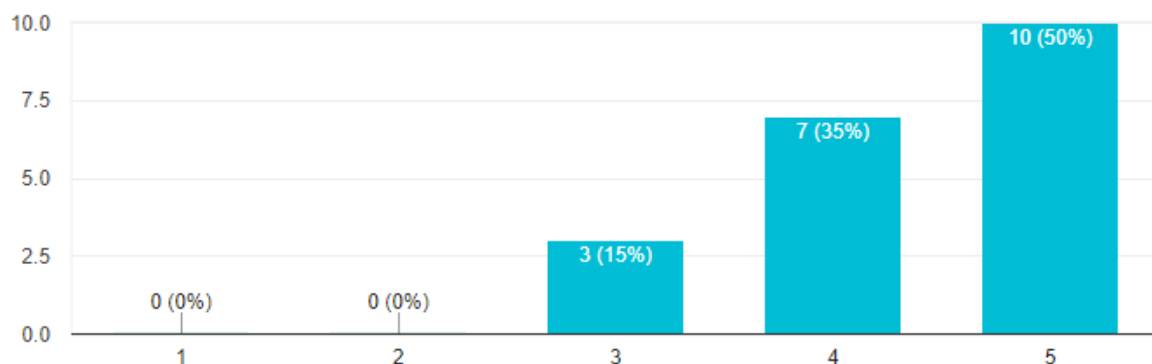
1. Rate the level of difficulty in locating the privacy policy of the platform.

20 responses



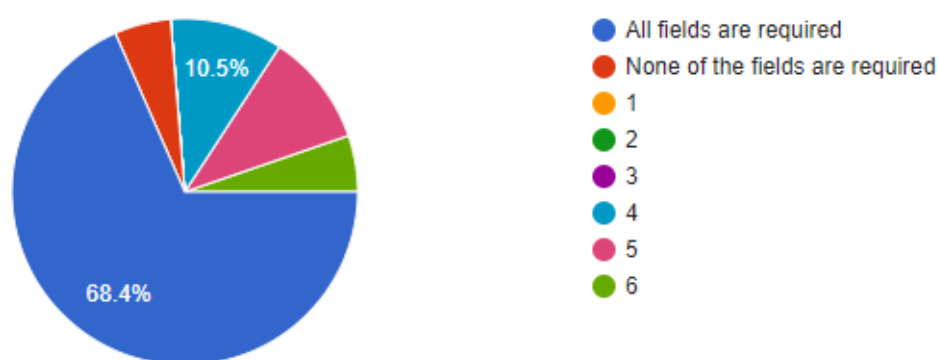
2. How unclear(1) or clear(5) is, in the privacy policy, the purpose of collecting and processing your data.

20 responses



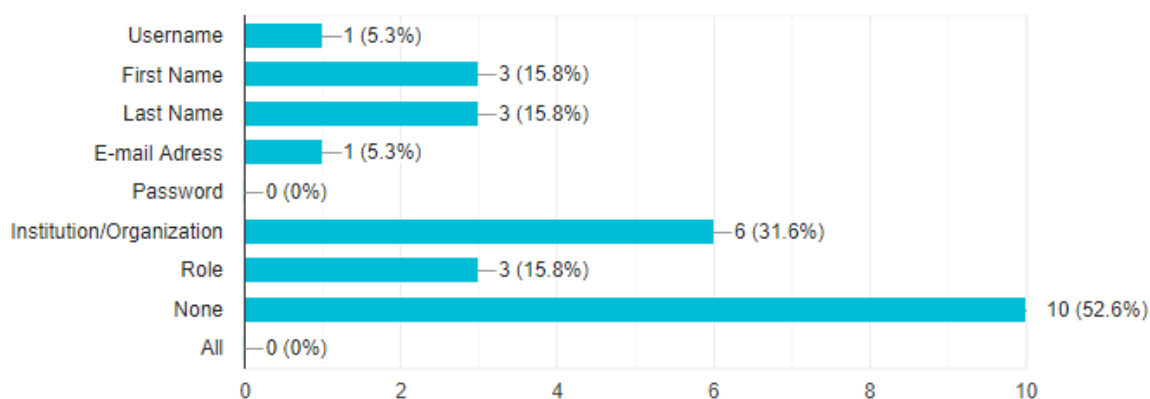
3. How many are the required fields in the registration form?

19 responses



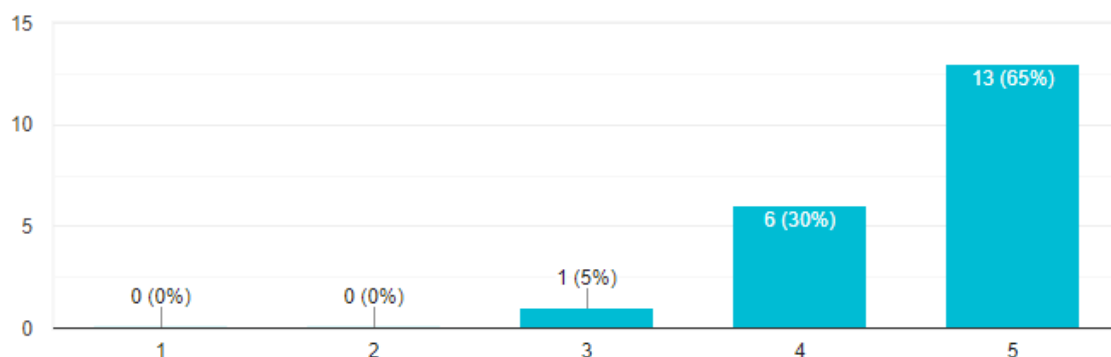
4. Which of the following required fields you would prefer not to fill?

19 responses



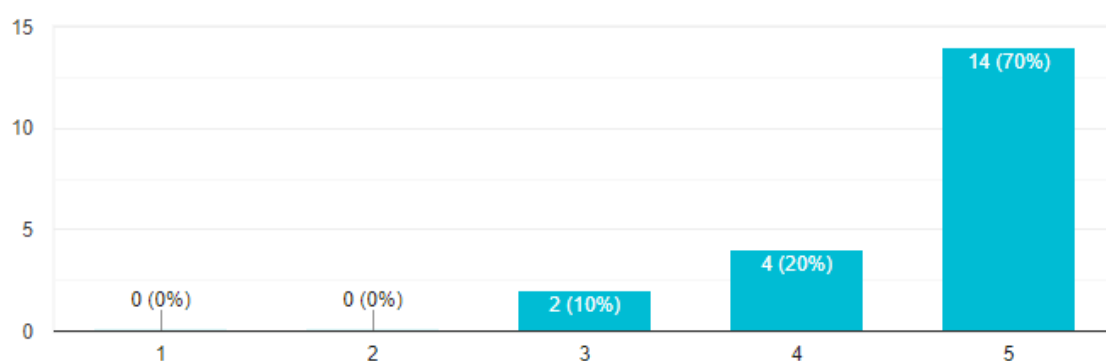
5. Rate the level of difficulty in locating the area where you can edit your account details.

20 responses



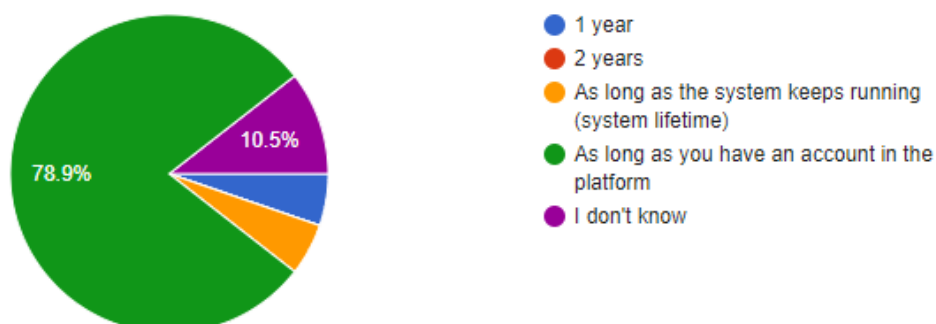
6. Rate the level of difficulty in editing your personal data.

20 responses



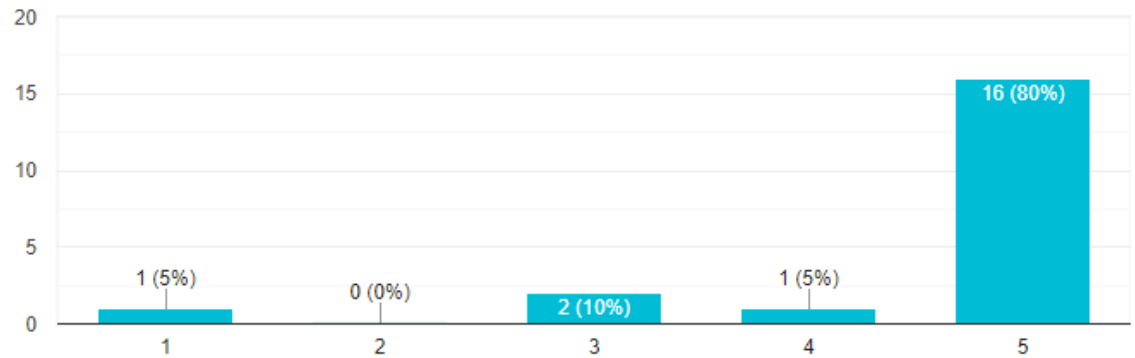
7. After having read the privacy policy, how long will your personal data be kept in the system?

19 responses



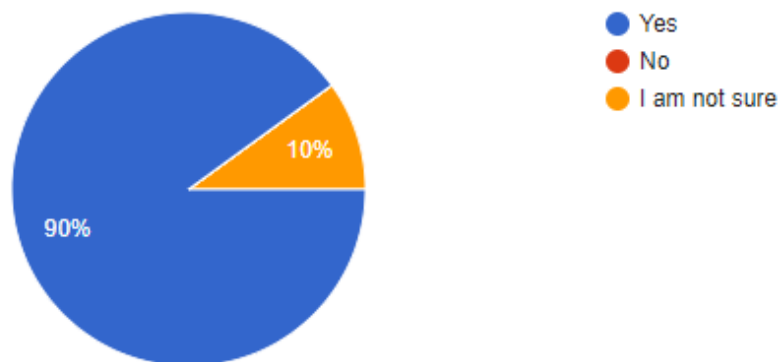
8. How unclear(1) or clear(5) is the time period that the system is going to store your personal data.

20 responses



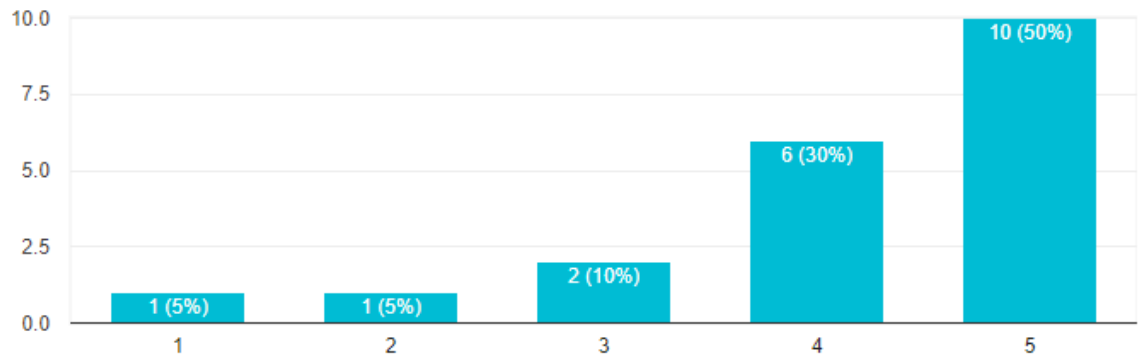
9. Before creating an account on the platform, did the system ask for your agreement on privacy policy?

20 responses



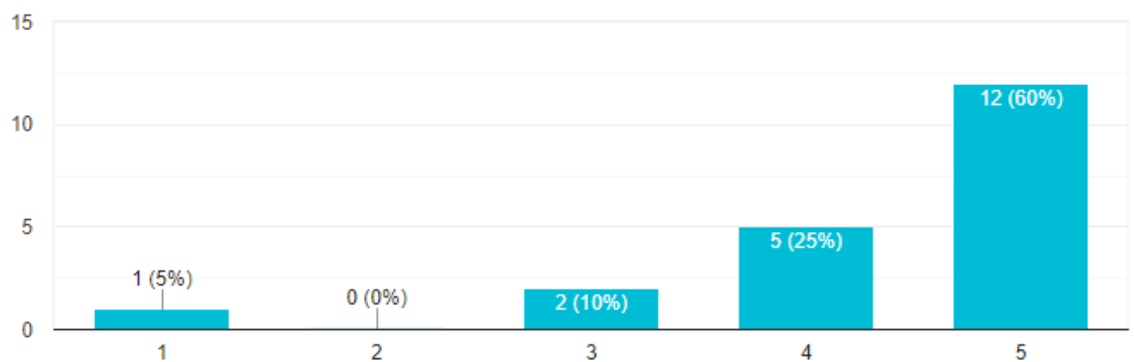
10. How unclear(1) or clear(5) is it to you that after you delete or restrict your account you withdraw your consent?

20 responses



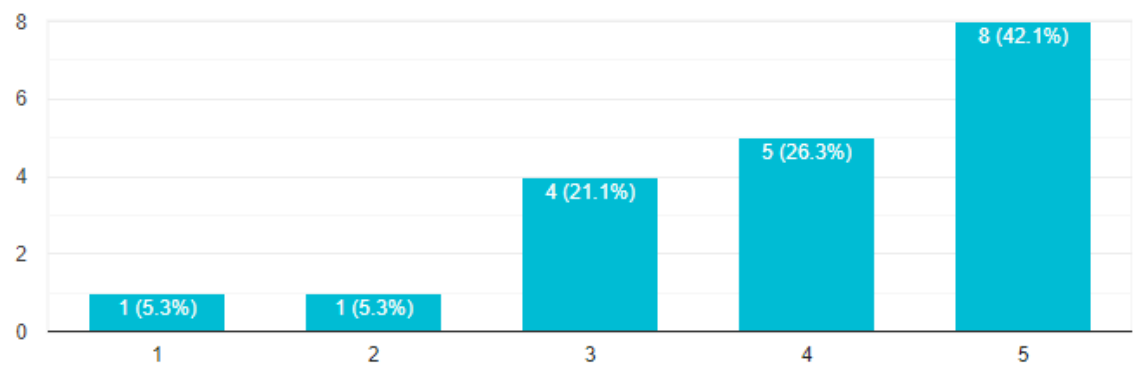
11. Rate the level of difficulty locating the delete account property.

20 responses



12. Rate the level of difficulty in locating the restrict account property?

19 responses

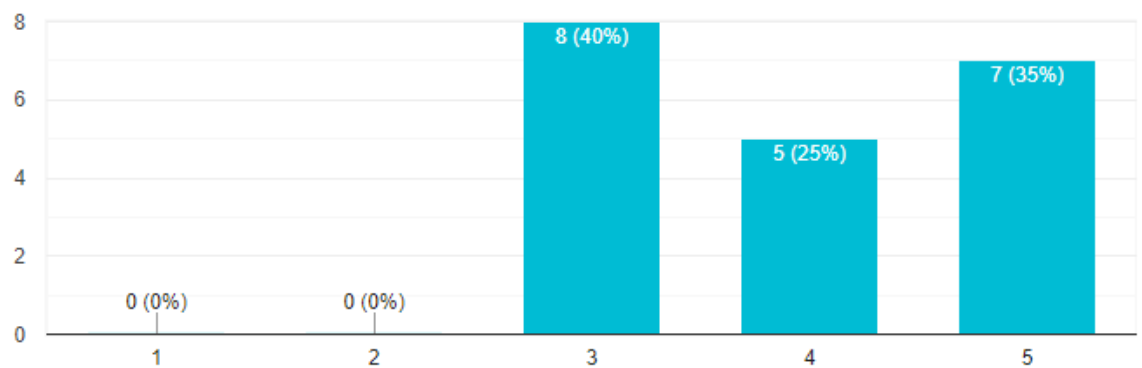


13. If you were to delete or restrict your account what actions of the following do you expect to happen (can choose more than one)?



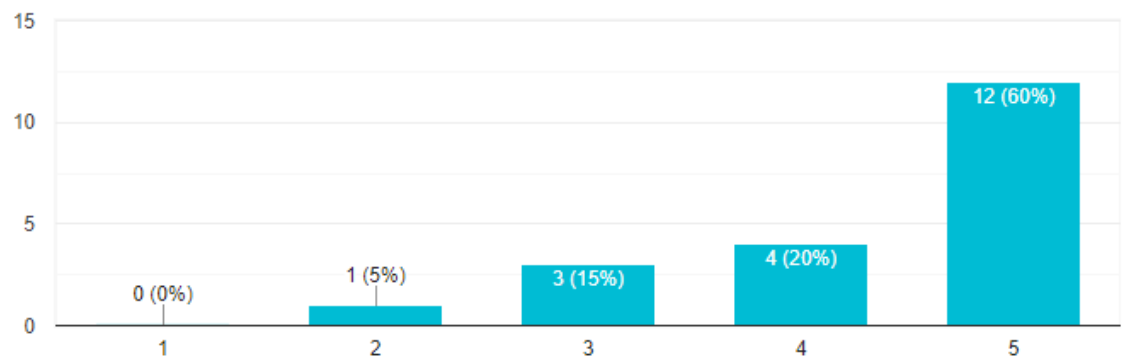
14. Rate the level of usefulness of the restrict account property.

20 responses



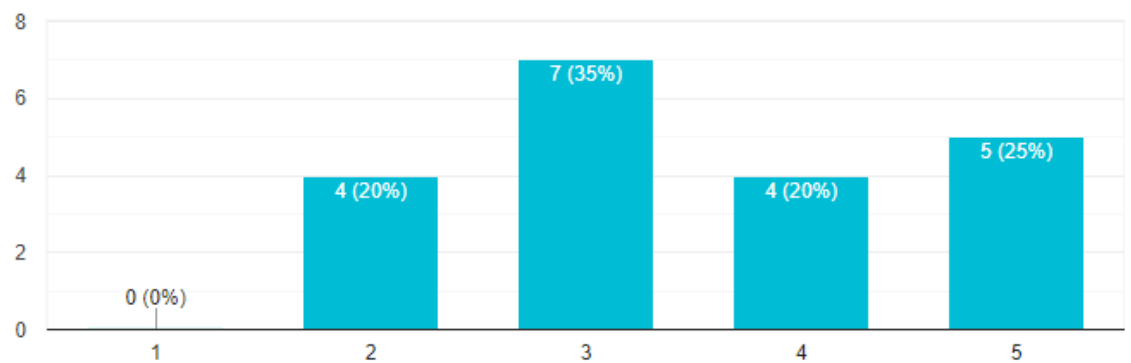
15. Rate the level of difficulty in locating the export personal data page.

20 responses



16. Rate your level of interest for exporting your personal data.

20 responses



17. After exporting your personal data, rate the level of your understanding of the format.

19 responses

