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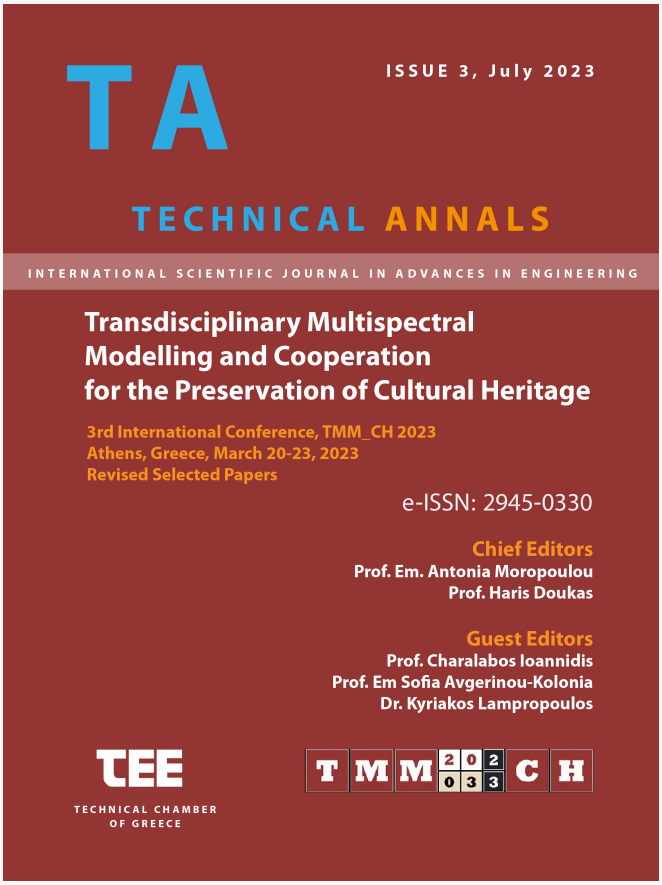

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Innovative and transdisciplinary educational approach through the EDICULA toolkit

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Abstract. The EDICULA educational toolkit regards an open source educational platform that addresses key issues in the rehabilitation, protection and sustainability of Cultural Heritage (CH) assets, and disseminates valuable know-how and experience both to the wide audience as well as to CH stakeholders, scientists and professionals. The fundamental characteristic of this platform is that it promotes a holistic approach for transdisciplinary documentation, based on the experience and know-how of the EDICULA partners and – in the future – of the users as they will begin to utilize it. Both EDICULA toolkit modules are described after the development of the main thematic areas, the development of the toolkit on a moodle platform, and the preparation and uploading of the educational material. The access to the EDICULA educational platform, the layout of the educational platform, the types of educational material uploaded, the issues related to the toolkit-to-user information presentation approach and educational aspects, the complexities encountered and how they were overcome are being analyzed. The issue of users and degree of commonality between EDICULA-4-all and EDICULA+ educational toolkits is described. Emphasis is given on the way the modules are differentiated from one another. The access level is the main issue, which eventually provides a "smooth" transition between the two modules, ad hoc per user, under the supervision of registered and approved administrators or advanced users with editing privileges.
The joint utilization of both the EDICULA-4-all and EDICULA+ toolkits in the educational, advisory or research processes, is at the core of the EDICULA project's scopes.

Keywords: EDICULA, Toolkit, Modules.

1 Introduction

The EDICULA educational platform provides and supports the education on a holistic approach for transdisciplinary documentation of CH protection and sustainable

rehabilitation; a very complex scientific field indeed. This necessitates the introduction of varying levels of complexity – taking into account the education background and needs of the users – with the EDICULA+ toolkit providing the advanced 'complexity" level.

The key issues that this educational toolkit addresses are related to:

- the enhancement of the educational aspects of engineering innovation
- the emergence and establishment of transdisciplinarity as a new trend in the protection of monuments
- the capabilities of multi-modelling methodologies for multi-discipline management and analysis of knowledge
- the capabilities of Augmented Reality (AR) and Virtual Reality (VR) to effectively diffuse information for social responsibility and awareness

Within this framework of key issues, the EDICULA educational toolkit covers the fundamental thematic areas relevant to CH, at an appropriate detail as required and as feasible, through an educational-oriented approach that fuses different information and experience from various use cases into educational material that is effectively organized and disseminated. The educational toolkit focuses on the analysis and dissemination of state-of-the-art scientific transdisciplinary methodologies, and in this matter, to educate users on how to employ them in the field of CH protection, as well as to other relevant fields or use-cases.

This toolkit contains two modules/toolkits, the EDICULA-4-all module, which is addressed to a more general public and the EDICULA+ module, which addresses more specialized users.

The main issues encountered and addressed in the development of EDICULA-4-all module, are to a large degree valid for the EDICULA+ module, since both educational toolkits have a very high commonality. This is expected due to the fact that the field of CH protection covers a wide range of issues, that are of interest to both the general public, as well as to more specialized users. In addition, the methodological approach for the architecture of both toolkits and the development of the thematic nodes, are common to both modules. These have already been described in detail [1]. It should be clarified the thematic subjects are common to both modules, and a common platform (moodle) is used for their development. The differentiation centers on the presentation/accessibility of the uploaded material to the users of each toolkit, based on their educational needs.

There exist other educational platforms, relevant to Cultural Heritage such as those described in [2 – 6]. However, most either exploit existing databases without focused content with emphasis on the prevalent issues of CH protection, or they refer to short educational courses with associated educational material.

1.1 Cooperation framework for the development of the Architecture of the EDICULA Educational Toolkit.

The EDICULA Educational toolkit covers a wide range of thematic areas, relevant to the protection and rehabilitation of CH assets. It is inevitable that not everything can be covered – especially in full detail, however, the close cooperation between the

EDICULA partners, with NTUA as the leader organization of Toolkit, manages to provide educational material to those thematic areas where the partners provide valuable expertise.

All partners cooperated in order to provide their own know-how as well as to identify the differences between the two modules. The close cooperation of all EDICULA partners ensured that each partner made contributions across a broader range of thematic areas beyond their individual expertise, essentially enabling them to engage with each thematic area from their unique perspective. This cooperation framework was more effective, providing the opportunity for exchange of ideas and experiences.

In the case of the EDICULA+ module, the special issues involved in these thematic areas, and the creation of necessary educational material, demanded a close cooperation between the EDICULA partners, in order to optimize the specific advanced information to be incorporated as well as to ensure an effective educational attribute, scientific quality and completeness.

2 Overview of the EDICULA Educational Toolkit

During the first stages of the toolkit development, much effort was provided on its architecture, to ensure that the chosen thematic areas are the most suitable and can be accompanied by pertinent educational content upon uploading. [1]

This work describes the following issues:

- Access to the EDICULA educational platform
- Overview of the layout of the educational platform
- Types of educational material
- The toolkit-to-user information presentation approach and educational aspects
- Difficulties encountered and limitations.
- The issue of users and degree of commonality between EDICULA-4-all and EDICULA+ educational toolkits

The educational toolkit addresses three fundamental prerequisites. Firstly, it provides flexibility through its e-learning platform, enabling easy navigation and immediate access to all main categories and activities of the toolkit [7]. Furthermore, no previous knowledge in cultural heritage or its rehabilitation is required to assess EDICULA-4-all. Last, EDICULA+ will provide an easy sequential learning progress, divided into basic and advanced modules, enabling the end-users to experience a learning procedure. The roadmap to the EDICULA Educational Toolkit, as developed, is depicted in the following schematic.

Both EDICULA-4-all and the EDICULA+ educational toolkits are based and developed on the same thematic content – ontologies and utilize the common platform. However, they adopt a different utilization and adaptation of semantics and narration. Specifically, the EDICULA-4-all educational toolkit focuses on the monument, the values, the aesthetics/architecture and the history. In comparison, the EDICULA+ educational toolkit, focuses on the various disciplines involved in CH protection, the relevant techniques and methodologies.

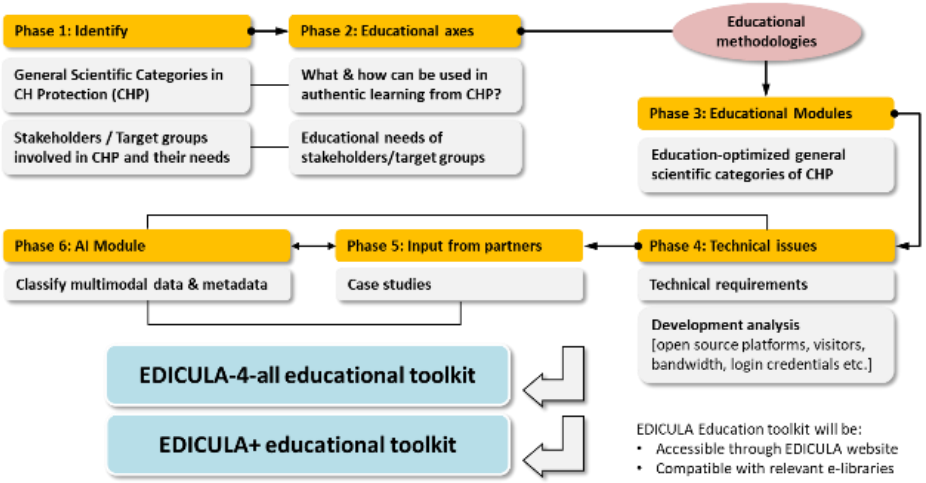

Fig. 1. Roadmap for the EDICULA Educational Toolkit.

The EDICULA educational platform is accessed through the website of the EDICULA project [8], Figure 2.

3 The general layout of the educational platform

The Educational platform is supported by moodle [9], since this is the software platform which also supports the National Technical University of Athens e-learning platform Helios [10], and on which there has been extensive experience throughout the last three academic years after its initiation of use.

The moodle/helios despite its shortcomings regarding the aesthetics and design capacity offers one main advantage, i.e. an organized deposition of data and natural navigation within the uploaded folders. Moreover, the general friendliness of the moodle platform, regarding modifications of the structure (e.g. addition of new folders) is rather straightforward to users with low level of expertise in IT applications. The alternative, i.e. the utilization of specialized software would instead invalidate the whole concept of user interference.

Upon login to the educational platform, the users can see the four main categories of the thematic areas, (Fig. 3) through which they can navigate to study the educational material uploaded to the relevant thematic areas.

The courses are organized within the thematic areas as seen in Fig. 4, with some modifications and additions, as required for the better organization of the educational material and to better serve the educational purposes. [11]

The triangular arrows (Fig. 5) next to the titles indicate categories which can be extended in view (down bold triangle) or contain further subcategories (right bold triangle). Those categories that do not contain any further subcategories are indicated with right empty triangle. The indicates a course, within which the relevant educational material is documented.

The navigation is straightforward, and the user – depending on his access privileges – can open the respective links (files, website links) as desired. In general, the toolkit provides the impression of an informative website and is treated like that by the user.

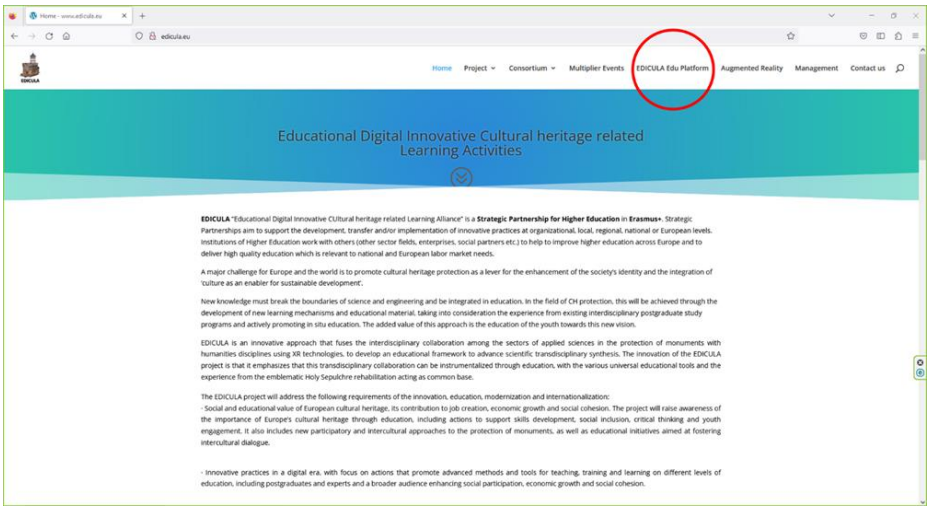

Fig. 2. Access to EDICULA Educational platform through the EDICULA website. [8]

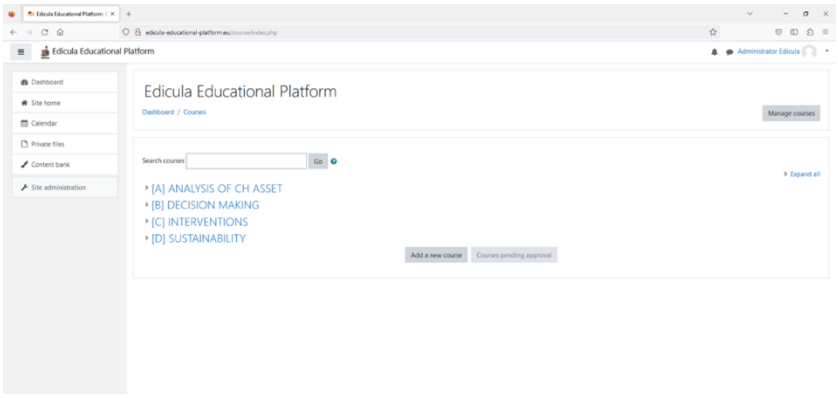

Fig. 3. Introductory page of the EDICULA toolkit with the four main categories.

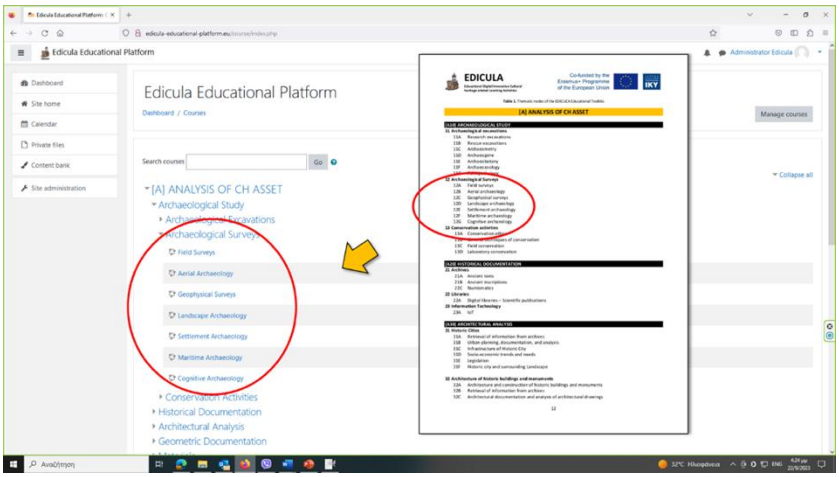

Fig. 4. Organization of categories and courses.

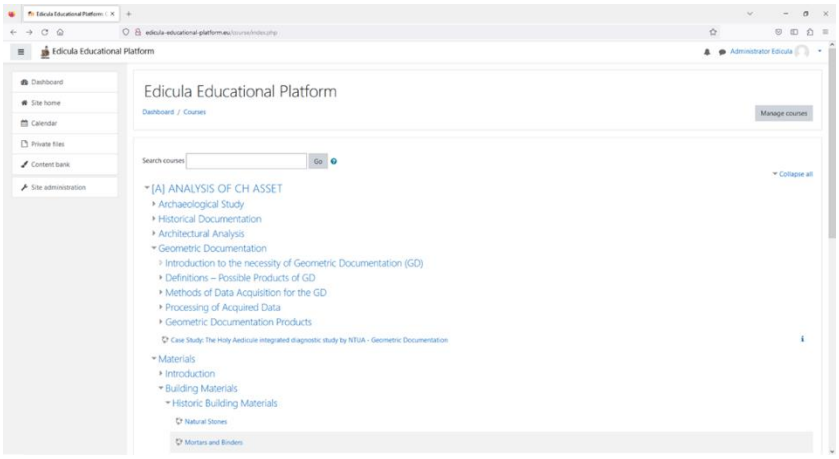

Fig. 5. Example of categories and subcategories page of the EDICULA toolkit.

4 Types of educational material

The EDICULA partners, have coordinated uploaded various types of educational material types, which are available at the EDICULA toolkit. These include the following:

1. Overview presentations–educational lectures [pdf file]
   (e.g. Figure 6 – see path 🗁 Analysis of CH Asset/Materials/Building Materials/Historic building materials/Natural Stones ➲ Historic building materials-stones)
2. Case studies-projects presentations at conferences / workshops [pdf file]
   (e.g. Figure 6 – see path 🗁 Analysis …. ➲ Study of the stone rubble masonry of the Holy Aedicule)
3. Links to open access scientific publications (papers) [link]
   (e.g. Figure 6 – see path 🗁 Analysis …. ➲ Study of the Plaka Bridge historical and restoration stones: link [12])
4. Links to scientific publications (papers) [link], which are not open access, thus, it is not allowed to upload the full scientific paper. It can be downloaded, if the user or their institution has subscription to this specific journal to download the respective pdf file
   (e.g. Figure 7 – see path 🗁 Analysis of CH Asset/Materials/Building Materials/Historic building materials/Mortars and Binders ➲ Study of historical mortars and design of restoration mortars - General: link [13])
5. Links to websites with relevant information
   (e.g. Figure 6 – see path 🗁 Analysis of CH Asset/Materials/Building Materials/Historic building materials/Natural Stones ➲ The Jerusalem sheet in 1:50,0000 scale [14]
6. Overview courses within main categories [course with various types of educational material]
   (e.g. Figure 7 – see path 🗁 Analysis of CH Asset/Materials/ ➲ Case Study: The Holy Aedicule integrated diagnostic study by NTUA - Materials)

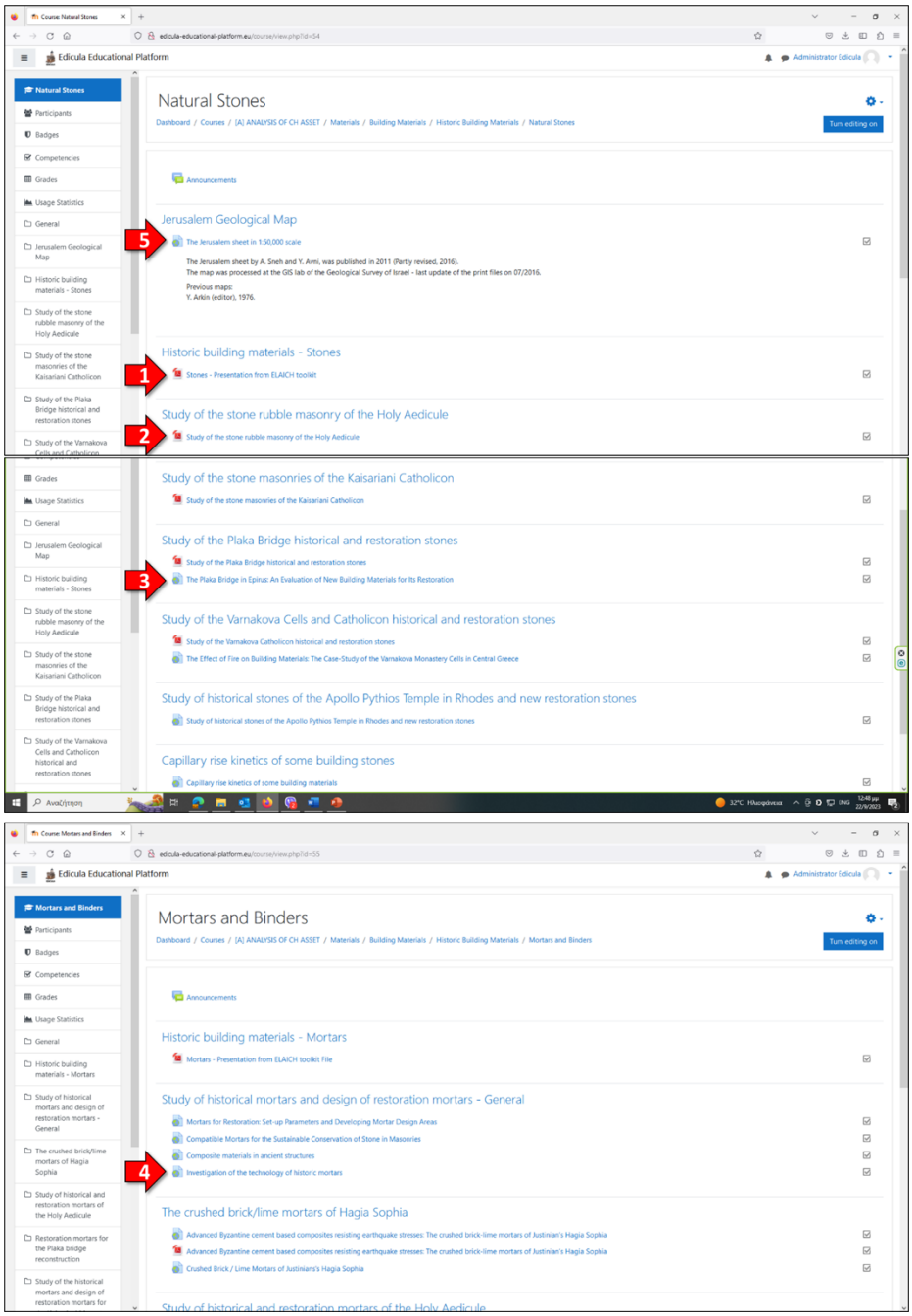

Fig. 6. Examples of types of educational material within the courses of the EDICULA educational platform.

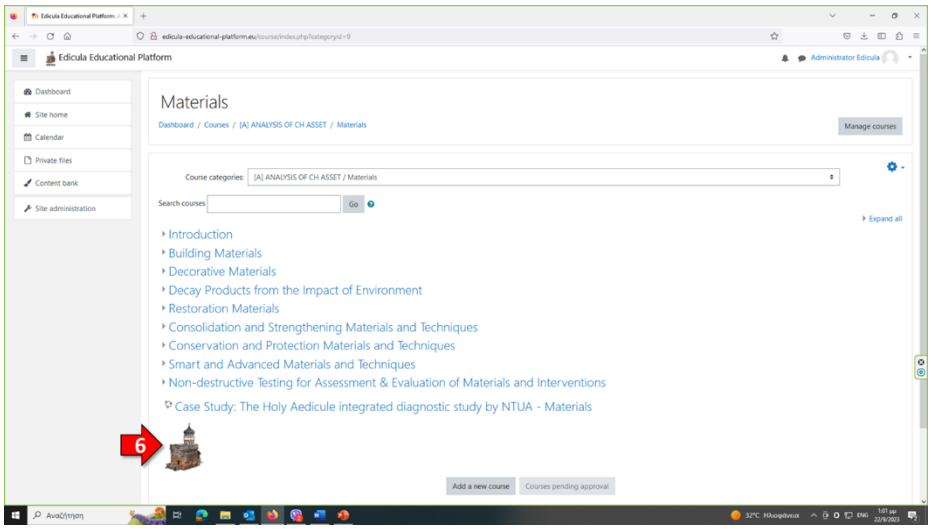

Fig. 7. Examples of types of educational material within the courses of the EDICULA educational platform.

5 The toolkit-to-user information presentation approach and educational aspects

Both toolkits regard a diverse composition of user groups highly dependent on the user's needs and ambitions. These user groups are being described below and have been taken into account to the preparation and type of educational material to satisfy varying levels of needs.

5.1 Access levels to target groups regarding EDICULA-4-all

5.1.1 General public

The general public refers to citizens with a wide variety of social and intellectual skills, but who do not have specialized knowledge in the field of cultural heritage protection, which is the focus of this educational toolkit. Still, this category includes users as diverse as people with basic-level educational backgrounds who are simply interested in the subject of CH protection, people who approach the toolkit from the perspective of economic interest, or people who simply want to obtain some skills and knowledge to better appreciate CH sites during visits. [15]

Since the general public has different expectations and learning capacity compared to more specialized groups of users such as CH students, professionals and experts, they will probably utilize the toolkit through an approach more akin to "surfing the internet". Specifically, the general public with limited knowledge about the various interrelated stages and categories of activities involved in the holistic rehabilitation, protection, revealing and sustainable preservation of cultural heritage, will most probably

follow an approach based on "curiosity" (regarding the thematic issues and the terminology), possibly intrigued by the provided emblematic case studies. [15]

In this framework, the inclusion in certain categories of emblematic case studies (Fig. 8), serves to "intrigue" the user (general public) to further investigate the subject, and better understand the terminology employed. For some of them, the inclusion of emblematic case studies (such as the rehabilitation of the Holy Aedicule in Jerusalem) is a "fascinating" subject that will probably generate more questions to them, which the various thematic areas and the uploaded educational material can probably provide them with some answers, or at least help them gain a better understanding of the whole process of CH protection. The gradual inclusion – upon the future utilization of the toolkit by more users and the scientific community – will enrich the variety of case studies within various thematic areas, further intriguing the interest of the general public and acting as the "starting points" of their "journey" in this exciting new (to them) field. An introductory explanatory text is often added to help the user become acquainted with the terminology.

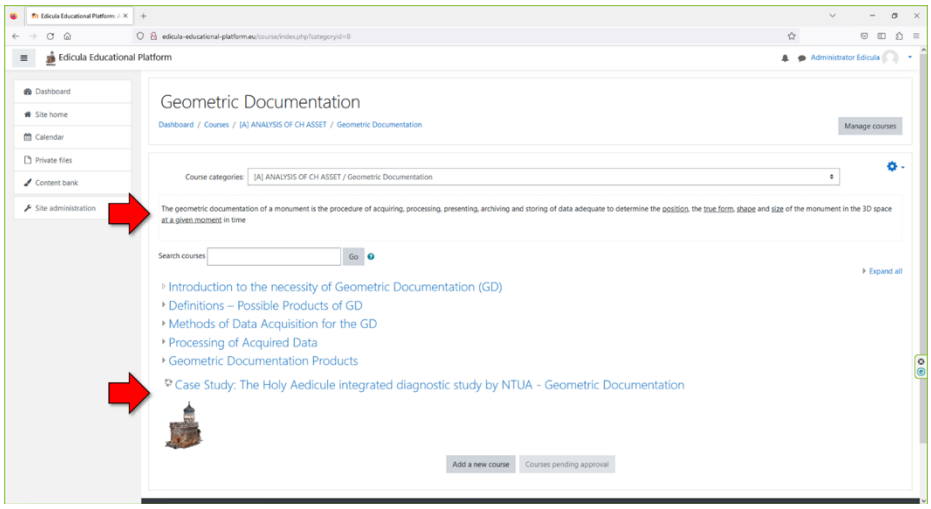

Fig. 8. The inclusion in certain categories of emblematic case studies (lower arrow) with information relevant to the specific category. An introductory explanatory text is often added to help the user become acquainted with the terminology (top arrow).

From an educational point of view, the above approach for the general public aims to ensure that the user is not "bored" through perceived endless provision of specialized subjects, but instead it is the user who selects ad hoc whatever suits their needs and curiosity. The educational material uploaded takes this into account.

The benefits of the toolkit to the general public center around enhancing the awareness of the social and educational value of European CH which can directly and indirectly contribute to job creation, economic growth and social cohesion. Through these types of educational materials, The EDICULA-4-all toolkit will allow the general public to develop new participatory and intercultural approaches to the protection of monuments, as well as educational initiatives aimed at fostering intercultural dialogue.

For the general public the provision of emblematic case-studies, such as the rehabilitation of the Holy Aedicule of the Holy Sepulchre, allows them to relate their own experiences with CH. More than often the "interface" between the general public and CH is tourism and travels. Many people that travel and visit CH assets often develop a need to learn more and better understand the site or monument they visited. Typically, the only resources available on internet are history-oriented websites (e.g. wikipedia), whereas in social media, CH sites are mostly represented by collections of photos. In neither case, however, the public can obtain a satisfactory understanding of the science and engineering behind the restoration, protection, and sustainable preservation of a cultural heritage asset they are interested in. As a result, the public perceives built CH as a "dead" field, which simply relays the story of the past to the present and to the future. As such, the efforts behind ensuring that such a continuity between the past and the future is feasible are totally unknown to them. The EDICULA toolkit addresses the above issues, clearly presenting the science behind the protection of CH.

A specific sub-group of people included within the general description "general public" regards the citizens with economic interest in CH protection. This sub-group includes many professionals not directly related to CH protection, but who would like to benefit from understanding how CH is protected and explore business opportunities. It includes merchants and professionals such as hotel operators, itinerary service providers, travel agents, tourist shops, restaurant / café operators, artists etc. that want to better understand the basic issues in CH protection to improve the services they provide. For example, tourist guides, who are in constant pursue of providing a better and up-to-date description to their clients (tourists), are often eager to add new "specialized" details in their tours or present the whole subject from a new perspective. Others may be interested in renovating properly their own property or business (e.g. a restaurant or a hotel at an old historic building in a historic town), collectively reviving historic neighborhoods (paper architecture). Some professionals such as hotel owners may better explain to their customers about the importance of visit restrictions due to maintenance arrangements, despite the inconvenience it causes to their visit schedule. Additionally, a properly restored monument or historic building in the vicinity of their hotel or business (shop, restaurant or café) enhances the business value of their own property. Some may even want to explore new business opportunities, such as materials or equipment for CH protection.

A special category of the above sub-group regards airlines. All airlines provide inflight magazines and entertainment materials (e.g. videos) which promote travel destinations. The airlines are eager to provide intriguing new information about the cities they provide flight to. An example of such a case was Aegean Airlines, which sponsored flight travels between Athens and Jerusalem during the project of the rehabilitation of the Holy Aedicule of the Tomb of Christ. In order to promote their contribution and enhance the attractiveness of their Athens-Jerusalem connection, they published two articles in their inflight magazine "Blue" [16, 17]. Most airlines promote the history and the preservation of the cultural heritage of their destinations, and thus, are interested in presenting activities that ensure the preservation of CH in their destinations. Such type of information is included in the EDICULA toolkits.

It should be realized that Tourism is a strong driving force for the general public either from the traveling perspective or from the perspective of economic development. In either perspectives, the demand for improved knowledge and the business diversity and business expansion opportunities are interrelated driving forces that often play a similar role.

Furthermore, the general public can indirectly (or directly in some cases) be involved in decision making processes, relevant to the protection of CH. For example, in a historic city, as citizens and professionals are getting more involved socially for the protection of their own city, either from the perspective of active citizens or due to economic interests, local and regional authorities must start taking into account their needs and requests. Therefore, although not directly involved in the actual decision-making processes themselves, or categorized as "stakeholders", the fact that these citizens and professionals start "asking" the right questions and press the relevant authorities for appropriate actions, it is a beneficial outcome and educational need that the EDICULA-4-all toolkit can be a valuable source of information for the general public. The toolkit-to-user information presentation approach for this group is, thus, focusing on case studies, which are presented and organized such that they provide concise and quick knowledge to the users, while acting as a starting point for further elaboration depending on the interests of the users and their level of engulfing the provided – more specialized – knowledge.

5.1.2 Students

The second group of users which the toolkit is addressed to, is the group "students". This term refers, obviously, to a wide-ranging group of users with challenging educational needs and ranges from elementary school students up to post-graduate students. For this group the toolkit-to-user information presentation approach does not only aim to enrich their knowledge in the field of cultural heritage preservation and protection. For users from this group, it is more important to disseminate to them the process of problem solving and the available methodologies and technologies to achieve this. [18]

The EDICULA toolkit is useful for the students since it offers them opportunities to improve their relevant skills in problem solving. For example, the inclusion of presentations focusing on specific subjects and their organization into a methodical set of information, helps them "sharpen" their investigation skills, and how to search for and analyze information. Although the scientific and technical communities are more acquainted with the links to scientific publications (e.g. journal articles), even at the level of students it is useful for them to realize that knowledge has varying degrees of complexity and availability that can only be gradually absorbed. Depending on the accessibility privileges, it would not be controversial to allow students to read a scientific article.

The other main respect of the EDICULA educational toolkit is the active advancement of Interdisciplinarity. In fact, Interdisciplinarity is also an important attribute that students should develop in order to ensure a common language of communication for their future professional skills. In the EDICULA toolkit, throughout the majority of the educational material provided, the interdisciplinary character of all methodologies and technologies employed and more importantly the analysis of their results is

systematically highlighted. The emblematic case studies underline the importance of interdisciplinarity to solve complex problems.

The toolkit-to-user information presentation approach, as developed, fully supports the educational needs of this user category.

5.1.3 Experts and professionals in CH-related stakeholders

Another group of users, for which the toolkit-to-user information presentation approach has been appropriately adapted, regards the group termed "stakeholders". The protection of CH and the values it carries is the responsibility of the central government and/or local and regional authorities, which collectively manage a wide range of CH assets. Often, a significant overlap of responsibilities is observed, between the central authorities and local stakeholders (prefectures, municipalities, private interests), most typically having to deal with who is responsible for the management and who is responsible for the maintenance and restoration of a CH asset. As a result, a complex bureaucratic environment is unavoidably unfolded, often with contradicting and unproductive interweaving boundaries of responsibilities. Adding to this rather complex and ineffective situation is the fact that many of these stakeholders are staffed by personnel not fully trained on the holistic character of CH protection, but instead rather apply their respective field of expertise in ad-hoc or discipline-bounded approaches. The situation becomes more complicated when private owners and institutions are involved, which not only perplex the level of ownerships and responsibilities, but most importantly, due to their limited specialized human resources may not be able to identify the real issues involved and how to address them. In either case, i.e., complex environment of ownership/responsibilities or reduced know-how/expertise, the decisions required from stakeholders for effective, compatible and sustainable interventions at CH assets, may not be the optimal ones.

The EDICULA toolkit addresses this important issue for stakeholders. First, it provides various case studies and educational material where the challenges of coordination between stakeholder and the scientific community are successfully addressed. Furthermore, the toolkit provides a systematic organization of the various processes, procedures and technologies involved in the field of CH protection and highlights the importance of scientific support to decision making instead of empiricism. Finally, it delivers case studies where interested stakeholders can study in comparison to the CH assets they are involved into.

In addition, the stakeholders' personnel can review the educational material, and in particular the material describing the use of various innovative methodologies, techniques and technologies, and acquire valuable knowledge of the capabilities of modern scientific tools for the comprehensive analysis of a CH asset. They can develop more overall knowledge, critical thinking and synthesis of all issues. As such, they can better prepare their reports or specifications for technical works, describing in more detail and with appropriate terminology the measures required to protect the CH asset which they are involved into. This is important both for legal purposes (to protect the interests of the stakeholder) as well as for the effectiveness of the interventions required.

Through the interaction with the EDICULA toolkit and its educational material, the personnel from stakeholder organizations can also deal with the requests from the

general public or the scientific community for interventions in the CH assets they are involved in their management. The general architecture and organization of the educational content of the EDICULA toolkit, serves exactly this purpose, where it can help stakeholders to select –based on scientific findings – the most effective, compatible and sustainable remedying measures required [1]. Thus, the toolkit is organized such that it supports their decision-making processes, highlighting all the necessary parameters and scientific fields and thematic issues involved, for a holistic and effective determination of the appropriate interventions.

5.1.4 Academic personnel and teachers

This category of users is divided into two large subgroups, based on the level of education. The first subgroup regards the teachers (elementary and secondary education) which utilize the EDICULA toolkit educational to prepare projects or lectures. This can be achieved through the preparation of educational material for students that presents in a concise and appropriately detailed manner (depending on the level of the students) all processes and technologies involved in CH protection, with the aim to educate students of the synthetic process of problem solving in a subject that is familiar to them. Also, the assigning of homework or project work to students, who can use the EDICULA toolkit to solve provided exercises or assignments can contribute. Additionally, teachers can provide additional information for specific monuments (case studies) as part of the learning activities in educational visits to archaeological sites, monuments or historical sites. [18]

The large number of thematic areas and educational material organized in the EDICULA toolkit provide a wealth of information that can satisfy a wide array of educational needs, ranging from non-STEM to STEM to largely engineering thematic subjects. The provision of specific educational material that is more pictorial and simplified mainly addresses the needs of elementary school teachers (note: it certainly does not imply a lower level of comprehension), since it is easier and more effective to transfer this type of information to their students rather than presenting complex information that may otherwise confuse the students or divert their interest.

The second subgroup of this category regards academic level tutors that utilize the toolkit to provide more specialized knowledge on their respective fields. This subgroup achieves this through slightly different approaches like preparing educational material with more specialized terminology and higher level of analysis and educational outcomes. Tutors are able to assign term projects to university level students, either focusing on in-depth analysis of the EDICULA provided case studies or focusing on analyzing in a similar process of analogous case studies or problems. They can also teach university students on how to search for, assess and evaluate scientific literature.

For this subgroup, the citation of specific published work provides a starting point for their students to search the specific subject. It does not, however, act as the sole knowledge provider or claim to be a fully inclusive depository of knowledge and information. As such, just like the students, the academic professors are encouraged via the toolkit-to-user information presentation approach, to search deeper in the thematic field of interest, where the EDICULA toolkit acts as the framework for systematic organization of searching the required information.

For the academic personnel teaching scientific fields relevant to the protection of CH, the whole EDICULA toolkit thematic architecture can facilitate the development of relevant curricula. This is feasible, since the EDICULA toolkit covers all thematic areas required for a holistic approach to CH protection and rehabilitation. Thus, a university educator, in this field, can utilize much of the provided material for the preparation of their lectures. For educators in fields not directly relevant to CH, it is mainly the synthetic nature of the organization of information and the modular type of educational material provided that is useful for them in the preparation of their lectures and notes. The architecture of the toolkits primarily triggers them to approach their course curricula in an interdisciplinary or transdisciplinary approach, where one of the main educational outcomes regards the systematic and science-based process of developing solutions to complex multi-parametric problems. This was similarly addressed in the EDICULA Teachers Course.

5.1.5 Researchers

The user group "researchers" refers to all those affiliated to academic or research institutions, or employed in CH-related organizations, but are not directly involved in decision-making processes for CH assets. For them, the main drive is the production of Innovation and Research, at theoretical or experimental/applied levels. Within this framework, the toolkit-to-user information presentation approach of the EDICULA-4-all toolkit functions as an initial repository source of scientific information. It is important to underline that such a repository can only function at the initial stages of a comprehensive research in the thematic issues addressed, not only because it is not feasible to contain all the scientific knowledge available, but also because – most importantly – the EDICULA toolkits are mainly educational tools and not pure repositories of data, in a sense of data platforms.

The EDICULA+ toolkit, is mainly the one relevant to Researchers, but even at the EDICULA-4-all module is useful for scientists too, especially those who do not have extensive knowledge and experience in the field of CH protection, but are called upon study relevant material for the applications they are interested in.

5.2 Access levels to target groups of the EDICULA+ educational toolkit

In terms of access level to target groups the EDICULA-4-all educational toolkit, is more "narrative" in nature and is addressed to the wide audience (with open access), including basic level of information. Therefore, it regards a set of educational material of non-specialized level of information that can be readily transferred in life-long learning and school education, demonstrating the effectiveness of transdisciplinarity in fusing science into general knowledge. On the other side, EDICULA+ educational toolkit, is the advanced module (with registered access), more "scientific" in nature, addressed to scientists and experts in the field of CH protection with an adequate scientific background or experience. It provides knowledge with more scientific details and encompasses advanced information, relevant studies, scientific papers, data and metadata of the knowledge gained by the consortium in the emblematic use cases such as the restoration of the Holy Sepulchre. It can be transferred to professional and university courses

addressed to architects, archaeologists, conservators, students in arts and other relevant engineering disciplines, demonstrating the need for a new teaching framework that promotes cooperation and utilizes complementarity between diverse disciplines. [19]

Within the above general framework, it should be clarified that the user groups do not necessarily indicate the access level to a specific educational toolkit or content therein.

The access level (i.e. what files become accessible and how much they can modify the existing courses) is granted by the administrators of the toolkit upon verification and evaluation. The access level is not analogous to the scientific background or level of expertise but is personalized on a case-by-case.

Although this may sound cumbersome and tedious, it is however more efficient, to avoid users who are self-described as researchers, thus, granted advanced access to the toolkits. This in turn necessitates the provision of one or more administrators, during the future use of the toolkits, to support these features. The EDICULA partners, and NTUA in particular, are committed to support the module for the foreseeable future.

There are four basic levels of user privileges:

1. Administrator
2. Advanced User with restricted editing privileges
3. Advanced User
4. Basic User

5.2.1 Administrator

The administrator has full-access privileges within the toolkit and moodle platform and can edit, add, reorganize or remove thematic areas, courses and educational materials. Currently, the EDICULA participants have each an administrator account, to allow full access to the toolkit. Obviously, upon evaluation from the EDICULA Steering Committee, other users can request and may be approved as administrator. For a non-EDICULA partner to be granted administrator privileges, they need to submit a formal report to the EDICULA Steering Committee describing their expertise, scope and educational rationale and roadmap for development of educational material. The Steering Committee will oversee the progress of the administrator's contribution in the toolkit and may propose modifications of privileges. [20]

The EDICULA Steering Committee is the scientific responsible for the EDICULA toolkits. Therefore, it ensures that any additional approved administrators conform to the strict criteria of scientific excellence, quality of educational materials and ethics that govern the EDICULA project and the EDICULA toolkits.

Potential additional administrators could, for example, originate from prominent academic institutions or CH stakeholders (e.g. Ministry), who in cooperation with the EDICULA Steering Committee could aid in the optimization and further enrichment of the EDICULA toolkits.

The approval procedure mainly aims to ensure that any approved administrator does not modify the toolkit without consultation with the EDICULA Steering Committee and other administrators, in order to avoid deletion of existing educational material or addition of files that are not directly relevant to the scope, quality and ethics of the toolkits.

5.2.2 Advanced User with restricted editing privileges

A user of this category is similar to the one described below but has restricted editing privileges. One of the main benefits of developing the toolkits based on moodle environment is that it consists of discrete "courses". This allows the administrator to provide various degrees of privileges within specific courses to advanced users. For example, a user of this category may be able to only see (and download) the available material in one thematic area (i.e. course) without being able to add or edit anything, while in another thematic area, in which they are experts, they may be approved to add, modify, or reorganize educational materials within that course. In effect, based on the experience of the Helios learning platform at NTUA, advanced users "register" for specific courses within a specific "curriculum". However, unlike the user level described below, they can participate actively in editing its content.

It should be noted that, as in the case of the additional approved administrators, an advanced user with restricted editing privileges also needs to submit a report about their planned activities for final approval by the Steering Committee. The Steering Committee will oversee the progress of the user's contribution in the toolkit and may propose modifications of his/her privileges.

Again, this approval procedure aims to ensure that the user does not modify the toolkit without consultation with the EDICULA Steering Committee and other administrators, to avoid deletion of existing educational material or addition of files that are not directly relevant to the scope, quality and ethics of the thematic areas approved or the toolkits in general.

5.2.3 Advanced User

The advanced user regards a person (typically a CH expert, undergraduate/graduate student, teacher, faculty, stakeholder, or researcher) that requires full availability of the toolkit content for the preparation of their own educational material (teachers and faculty), for informative purposes or for support of relevant reports (CH expert, stakeholders) or as part of their research (researchers). The advanced user, a term which mainly refers to their level of expertise, as compared to the more basic level of the general public or students, will have access (study and download privileges) to most of the material uploaded to the toolkit, albeit, without the ability to modify the content and organization of the toolkits. The administrator, as in the case of the user category described above, may opt to "register" the advanced users to certain thematic areas (courses) or parts thereof.

As noted above, administrator privileges are not limited only to EDICULA partners, but as the Toolkit is gradually being utilized by other institutions, universities and stakeholder organizations, more administrators can be added – upon approval by the EDICULA Steering Committee - that will manage their respective staff, employees and students. It is, thus, up to their evaluation to decide on the extent to which a user will have access to the courses of interest.

5.2.4 Basic User

The basic user regards a person (typically general public, stakeholder, CH expert or secondary education student) who aims to use the EDICULA toolkit either for informative purposes or as part of a course project (especially the students). Again, the term basic user is not representative of their educational level or professional / scientific background but rather to their needs and expectations from the toolkit. Obviously, a basic user is expected to have access to a more limited number of courses and educational material, and no editing privileges. [21]

For secondary education students, it is expected that their teacher will be registered as an advanced user with restricted editing privileges in order to manage the access limitations of the students. Alternatively, this will be done by a full administrator from a governmental body such as Regional School Administration, who in turn will register schoolteachers as advanced users only (i.e. without administrator privileges to avoid unwanted or accidental editing errors) and will overview the whole process of the EDICULA toolkit adoption in school curricula.

6 Complexities encountered

Much effort was made to design an architecture of the toolkit such that not only covers the wealth of thematic areas relevant to the protection of CH, but also is not difficult to use and apprehend the information included in it. However, several complexities were encountered and dealt with appropriately.

6.1 Extent of information uploaded to the toolkit

The main issue often encountered by the EDICULA partners who developed and uploaded educational material to the EDICULA toolkit was the desired and/or feasible extent of information provided in their educational material.

The first issue was if it was necessary to upload educational material to all the thematic areas included in the Toolkit at once. Regarding this, it was clarified during the transnational project meetings that it is not feasible to have available or develop educational material for all thematic areas included in the toolkit, nor the range of expertise of the EDICULA partners can achieve such an enormous challenge. However, the relevant thematic areas have been decided, included in the toolkit architecture and created in the moodle platform, for other users to upload relevant material. Again, it should be underlined that the EDICULA toolkit has not been designed to function as an information repository, but rather than as an advanced educational tool to aid various categories of users to better understand the issues involved in CH protection. As such, it is and will be reliant on the active participation of registered users that can and have the knowledge and expertise to prepare educational material to enrich those currently uploaded to the toolkit. It should be clarified, though, that such additions need to be made by established experts in the field, to ensure that the information provided is scientifically sound. In effect, the registered-users approach aims to ensure that the platform is

not transformed into something like the Wikipedia site, where often the information provided is of doubtful validity or misleading.

The second issue was if it is desirable to include presentations/lectures that were extensive in size (i.e. many pages). The size of the educational material provided was purposedly kept to "reasonable" size. The rationale for this was two-fold. First, an extensive educational material (e.g. presentation) would discourage those users not familiar with the terminology involved, potentially diverging their interest to issues other than those discussed therein. Second, as the extent of educational material increases, there is observed a corresponding increase of overlapping with other thematic issues, potentially causing confusion to the users. It was not a trivial process, but with these two guidelines in mind, all EDICULA partners prepared, developed and uploaded the educational materials.

Regarding the third matter the issue was how much simplified or vice versa how much complicated should the educational material be. The "dilemma" of simplification was very important and often difficult to address. Considering that the educational material uploaded would be studied by a wide range of users, it was not straightforward how much simplification could be introduced – to attend the requirements of the general public – without discouraging the more "advanced" users. In most cases an intermediate approach was adopted. The intermediate approach is still appropriate for both extreme levels of users. For the more basic level users, the inclusion of adequate details and understandable terminology aids them to realize – to some degree – the complexity of the issues discussed and intrigue their interest to search the subject further. For the more advanced users, the educational material serves as the initial point of research and as a concise and brief overview of the issues involved. It provides them with broad guidelines as to where to search for additional more specialized information if so desired.

The last issue was the one of providing a comprehensive list of references to scientific publications and if it is desirable to include many (if not all) the scientific references (known to the EDICULA team) for the subject discussed. Similarly with the above, the issue is bounded by two limitations. First, it is scientifically rather difficult to include all references available for any subject discussed. Second, even if such a comprehensive list could be prepared, it would become outdated, unless regularly updated. Instead, the provision of some important and/or representative references to scientific publications, serves (as discussed above) as a starting point for any thorough research on the subject is the most effective approach.

6.2 Overlapping of issues discussed in educational material

As mentioned above, there was a significant concern about overlapping of issues discussed in the educational material in some thematic areas, with educational material uploaded to other thematic areas within the toolkit. This was more common in the emblematic use cases provided in some educational material. To some degree, this could cause confusion to certain users, especially if they have studied educational material from the other thematic areas and could perceive some repetition. However, this overlapping should be instead assessed as desirable. The vast array of issues involved in the protection of CH cannot be approached unequivocally per discipline, nor do not have an impact on other aspects of this field. The overlapping of challenges, requirements,

restrictions and cooperation are normal practice for those involved in the field of CH protection and should be presented as such. As long as the educators who utilize the toolkit realize this, they can more effectively address complex educational needs and develop comprehensive educational material for their students. Similarly, the students, through the use of the toolkit, will recognize that certain "problems" have complex and intertwining "answers" and should be approached accordingly.

6.3 The moodle environment

As mentioned above, based on the recent experience of the NTUA with moodle software for the University's e-learning platform Helios, it was selected to support the Educational Toolkit. Although, initially, the EDICULA consortium was oriented to adopt a free, open-source software learning management system such as the combination of WordPress/LearnPress/LearnDash learning environments, it was discussed in the transnational project meetings that a more widespread platform should be selected, on which the participating academic institutions have significant experience. The selection of moodle had the additional advantage that in the future it could be easily integrated to academic institutions already using moodle to support their learning platforms.

For administrator users not acquainted with such a software environment, this was initially difficult to manage and upload the educational material developed. The NTUA IT team helped all EDICULA members through on-line training courses and communication (emails, phone calls, etc.), and as a result, all members got used to the process rather quickly. Another issue regards the focusing of moodle in a course-oriented approach for organization of materials. This is understandable since moodle is a world-class online learning platform. For people acquainted with data repositories this could be problematic since they tend to organize files in categories rather than in courses/topics. However, users that have uploading privileges got used to it quickly. It still creates an increased workload, since descriptive titles need to be added for all files uploaded. An issue encountered by the administrator users was the need, sometimes, to add categories or correct errors during the uploading of the thematic areas on the moodle platform. The most common error regarded the hierarchy of the courses created (thematic nodes), which sometimes proved difficult to correct in the moodle environment. It should be noted that despite these setbacks, the management and organization of the educational material was generally straightforward, although often time-consuming due to the large number of files to be uploaded, the description of each file and the appropriate organization.

An alternative specialized software platform could be developed, probably with a better platform-user interface. However, it would not have the advantages of full and future support that the moodle environment offers. Neither could be utilized by teachers for their tutoring needs, who are mainly acquainted with moodle already.

6.4 Transition from EDICULA-4-all module to EDICULA+ module

From the above analysis, depending on the extent of courses available to the users, they may be regarded to use EDICULA+ as compared to the EDICULA-4-all module. Effectively, the more courses and content the administrator provides access to the user,

the more they are shifted from an EDICULA-4-all content to an EDICULA+ content. This access granting process, in effect, defines a "smooth" transition between the two toolkit modules, without universal clear boundaries of their content. It can be vaguely described as a "twin" definition. Both modules are distinct, but no clear boundaries actually exist. From an engineering perspective, one can realize it as a gradual "diffusion" interface between the two modules. The important outcome of such an access setting process, is that there are exist no unique differentiations between the two modules, rather than boundaries per user as defined by the appropriate supervising administrator. This transition affects the analysis of the clusters and the interlinking matrix of the educational content, both of which are governed by the accessibility environment granted to each user.

6.5 Duration of support of the EDICULA toolkit

The EDICULA partners are committed to support the EDICULA toolkit for at least three (3) years after the completion of the EDICULA program. Moreover, the toolkit will continue to be updated with more educational material, through a dynamic participation of the EDICULA partners. Specifically, as the EDICULA partners complete analysis of data from their past and ongoing projects, relevant to EDICULA, they will develop new educational material which will enrich the toolkit thematic areas. Through this dynamic process, the toolkit will be continually updated and enriched which will encourage participation from the scientific community and other users.

7 Conclusions

Already the toolkit is filled with papers, presentations and various project's material in most of its courses. This shows that the toolkit can be a worldwide educational platform that is able to provide all kind of material relevant to its scope. The differentiation between the two modules is confusing but it achieves not to separate them from one another. Thus, the user is able to switch from one module to the other without the need of going to another site. Also, they (the users) are classified according to their rank and their needs from the toolkit, without realizing it. As a result, the two modules are united in some areas and separated in others in order for the toolkit to work better and provide the best experience for the user.

Also, the ability to offer different privileges to users is creating an environment of better interaction. For example, teachers are able to give to their students the appropriate educational material, as mentioned. In general, the toolkit gives the opportunity to every user to share their project or use the content already uploaded for scientific or educational purpose.

In conclusion, the EDICULA educational toolkit in both its modules, is set to become a valuable tool for the public, for students, teachers and educators, stakeholders and researchers, addressing a wide range of challenging needs for knowledge. It is set to serve as the starting point for all these user categories.

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