Methods and Tools for Centres of Integrated Teaching Excellence Providing Training in Complementary Fields

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Keywords: E-learning Platforms, Content Repositories, Adaptation of Educational Materials and Programmes.

Abstract: The necessity of flexible adjustment of training programmes to the needs of various target groups is an inseparable component of vocational training. The need to introduce changes may be a result of various levels of competency and the requirements of various student groups. In the case of distance training, the changes may also be forced by the need to introduce a different schedule, and may be the result of adopting an another training model. The article presents solutions facilitating the adaptive development of training programmes for the needs of the Centers of Integrated Heritage Teaching Excellence. The goal of these centres is to provide training programmes on the protection of cultural and natural heritage. The article shows how the need for flexible construction and adjustment of training programmes affected the form of educational materials on the basis of which training is conducted, and what technical tools should be utilised in order to efficiently manage the process.

1 INTRODUCTION

The technology use in the process of training transforms in response to the needs defined by educators, the needs and habits of the students, and technological progress. In recent years, the technological progress and its growing accessibility have caused significant development of methods and tools facilitating the process of academic education and vocational training. Widely distributed and easily accessible IT systems are improving distance learning, including Learning Management Systems, which facilitate communication with students and sharing educational materials, systems supporting synchronous communication (video conference, instant messaging, chats), group collaboration tools, etc. New forms of conducting training and mutual sharing of content and training programmes, such as MOOC and Open Educational Resources (OER), have also become popular.

The existing educational environments offer training courses intended for well-defined target groups with known needs and competency levels. In academic teaching, the educational offer stems from the faculties, specialities, or the difference between compulsory and optional classes. The topic of classes depends on the study programme and the related education outcomes. Similarly to vocational training, the training programme is developed in response to the known needs of a specific target group. In the case of remote training for training programmes defined that way, it can be assumed that educational aids will be provided to students as a whole. This is the result of an assumption that a student will use them in sequence, completing each batch of a training programme. It can only be assumed that certain batches of material will be omitted if the student already possesses adequate knowledge and competence in a given area. Adoption of such an assumption determines the structure of the materials. During their development, the author can treat them as a whole, filling a given training programme thematically.

The situation is different when, due to a different characteristic of the target group than expected, the training programme and the enclosed educational materials require modification. These modifications may be a consequence of replacing certain content. They may also be forced by the necessity to replace the materials themselves due to their difficulty level, the educational aids in use, their interactivity level, or the provided examples which may be unclear due to cultural context. The need to adjust training

Marciniak, J.
Methods and Tools for Centres of Integrated Teaching Excellence Providing Training in Complementary Fields.
DOI: 10.5220/0007765905270534
In *Proceedings of the 11th International Conference on Computer Supported Education (CSEDU 2019)*, pages 527-534
ISBN: 978-989-758-367-4

programmes and materials will manifest particularly in a situation in which the training involves mutually complementary topics, where the training programmes involve the same topics but viewed from different perspectives and including various experiences of the students.

During the construction of the Centers of Integrated Heritage Teaching Excellence (HEP, 2019), it was necessary to include in the cultural and natural heritage area the fact that the topic of cultural and natural heritage protection is treated separately in the current heritage policy. The role of the centres is providing integrated training programmes intended for professionals, decision-makers and experts in both areas, which include people of various levels of preparation and competency. Due to the wide target group, which includes archaeologists, administrative workers of the heritage protection sector and forest service workers, it was necessary to equip the centres with tools to conduct training remotely with the use of educational materials adjusted to the needs of the various groups of students.

2 OVERVIEW OF THE EXISTING SOLUTIONS

Current e-learning environments offer a wide range of solutions facilitating training, both in academic society and vocational training. Online courses are offered in the Massive Open Online Courses model (MOOC) by players such as Coursera, EdX and many others (Coursera, 2019), (EdX, 2019). Remote training model is used mostly by universities and training companies. Such training is prepared in response to the needs of specific target groups. The offered courses encompass a clear thematic range, target a specific group of recipients, and include an expected level of student competency. If a specific target group possesses a profile different from expected, i.e. has different requirements regarding thematic range, difficulty level or manner of framing a specific topic, their participation in the offered course will not satisfy their needs.

The topic of adjusting courses to the needs of students is a subject of consideration in the area of Intelligent Tutoring Systems (Barbosa et al., 2018), (Dias et al., 2014). The systems of that type are intended to adjust to the requirements and competency level of the student. Adaptation may involve the thematic range, material difficulty, various learning styles, language, cultural context, etc. Systems which adapt to the needs of the student prove useful in situations where differences within the group of students of a single training programme are noticeable: the group is non-uniform. The system adapts to the needs of the students by selecting appropriate educational materials, and minimising identified gaps in knowledge and competency. This facilitates adaptation to the individual preferences regarding learning style, interactivity level or language of the student. The use of Intelligent Tutoring Systems is not necessary when the trainer knows the needs of a specific student group, which are different from the ones in the existing training programme. In that case, it is only necessary to adjust the programme by changing the teaching methods and educational materials before admitting a given group to the training. In order to make this possible, the trainer has to possess tools which allow the adaptation of materials. Furthermore, the educational materials have to be in a technical form, in order to carry out such activities without the need of recompiling the entirety of the material.

Materials facilitating teaching are stored in Open Educational Resources (OER) (Katz, 2018), (Merlot, 2019), local repositories (Singhal et. al., 2019) and e-learning platforms (Tasso et. al., 2018). The task of OERs is accumulating freely available training programmes and educational materials in digital form. Materials are stored in the same form as provided by their author. Therefore, repositories contain files in form of text (pdf, word), graphics (jpg, gif), films or aggregated materials (SCORM packages). The role of OER involves storage, searching and sharing resources. Compiling them for the needs of a specific programme or training group has to be done by the entity which downloads them, with the use of their own tools and competencies. Local repositories mean any platform on which the trainers of a given institution store materials for the purposes of their lessons. Just like with OERs, the technical properties of these materials can be different. The materials are stored with the use of various tools, such as remote drives or cloud catalogues. Educational materials may also be stored on e-learning platforms. They are created and aggregated there with the use of the tools of a given platform (e.g. using the pages of the Moodle system). In most cases, they are maintained by a single educator and versioned in a cycle resulting from the course of editing each class.

Within the area directly associated with the topic of training courses offered by competence centres, i.e. within the area of protection and management of cultural and natural heritage, there is a wide offer of training courses; however, it only encompasses one

of the two aspects. This results from the manner in which the topic of heritage protection was previously implemented in the politics of each country or region. Dividing the topics was also the result of having different target groups. On the one hand, these are specialists from the sector of cultural heritage protection, i.e. conservationists, archaeologists, local administration. On the other hand, there are foresters or environmental protection services. Most training courses from either topic are offered via the traditional in-class model, there is also a small number of remote courses.

3 CENTERS OF INTEGRATED TEACHING EXCELLENCE IN CULTURAL AND NATURAL HERITAGE

3.1 Training Requirements of the Target Group

The goal of the Centers of Integrated Teaching Excellence is to provide training on cultural and natural heritage, including the needs of varied training groups, i.e. specialists in heritage protection and specialists in natural heritage protection. Because the subject matter is mutually complementary and divides the form of the training courses, it can differ depending on the target audience of the training. Among the offered courses, there are ones intended for the representatives of the heritage management and protection sector and specialists in natural heritage. The offer also includes training courses for professionals in cultural and natural heritage protection who are not experts in any field but are interested in integrated heritage management. Each course has a different scope of materials, length and manner of conducting the training.

3.2 Model of Organisation and Conducting Training

Due to the dispersed character and requirements of the target groups, it is assumed that training within the framework of the Centres of Integrated Teaching Excellence will be conducted in three remote models:

- Scheduled course sessions with an instructor and certification,
- Open access to didactic materials on a website,
- Open access to didactic materials on an e-learning platform.

The first mode is directed to people who value the presence of an instructor on the course and who can follow a fixed schedule of course sessions. Open access to didactic materials on a website is a model intended for people who are interested in a given issue and seek further education in self-paced training mode or those who wish to start comprehensive training with a trainer via the course provided in this mode. The last model allows for education in self-paced mode but with community support, e.g. via internet forums. The characteristics of training courses in all three modes is presented in table 1.

Table 1: Remote training models.

Scheduled course	Open access on a website	Open access on an e-learning platform
Facilitated e-learning or blended learning	Self-led training	Self-led training
Scheduled	No set schedule	No set schedule
Facilitator if needed	No facilitator	
With trainer / mentor	No trainer / mentor	No trainer / mentor
Login needed	No need for login	Login needed
E-learning platform used	No e-learning platform	E-learning platform used
Paid or for free	For free	Paid or for free
Asynchronous or synchronous	Only asynchronous	Only asynchronous
E-learning materials chosen from the repository	E-learning materials chosen from the repository	E-learning materials chosen from the repository

3.3 Structure of Educational Materials

The methods of conducting training adapted by the centres are based on the asynchronous model. This means that the educational materials available in digital form provided at each stage of training serve as the primary source of knowledge to the students. If a trainer is present in a course, he/she fulfils support functions, especially in the model without traditional meetings. For the purposes of the centres, digital multimedia and interactive educational materials were created. The materials were developed as eight independent e-learning modules. Each of them comprises over a dozen units (11 to 15). Each unit contains several learning objects. The modules contain units of theoretical character, describing various aspects of cultural and natural heritage protection and management, as well as units of a

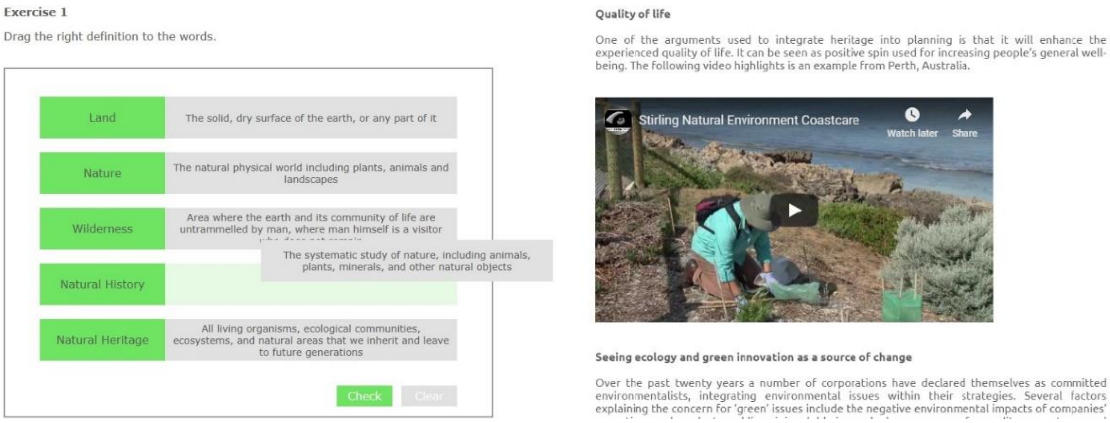

Figure 1: Sample learning objects.

practical character, which illustrate the implementation of the described topics in various countries and regions via numerous case studies. Table 2 contains a detailed list of modules and their components.

Table 2: List of modules and their components.

Module	Number of units	Number of learning objects (total per module)
Europe's cultural landscapes: opportunities and threats	8 theoretical 6 practical	81
Heritage strategies, what, why, where, how, by whom and for whom?	5 theoretical 6 practical	82
Nature Conservation for Cultural Heritage Experts	5 theoretical 6 practical	64
Cultural heritage management for nature heritage managers	4 theoretical 6 practical	66
Traversing the disciplines of ecology and archaeology: the new horizon	6 theoretical 6 practical	82
Integrating heritage in land-use planning	6 theoretical 6 practical	76
Ownership and Benefits of Heritage	5 theoretical 6 practical	74
Participatory practices	5 theoretical 6 practical	79

The hierarchical structure of the modules was designed in a way which allows to use the components in a compositional way in newly compiled materials. The concept of reusing component modules requires the content to be edited appropriately (Kok, 2009). The modules must also be in an appropriate technical form so that their decompilation is possible without the need to work with the source files of the module. It should be noted that, while editing the modules, the text should be divided so that the content is placed in components of the smallest granularity (learning objects) in a way that both exhausts the discussed topic taking into account the defined effects of education, and also written including placement in components which come before and after each component. The content was structured in the developed module with the use of UCTS, which constitutes a reference model in the compositional division of content in e-learning modules on various levels of detail (Marciniak, 2014). The compositional approach requires the content be distributed over a sequence of components of the smallest granularity (learning objects) to come together as a larger whole at the higher level (unit). A similar compositional structure of several units has to come together as a larger whole, i.e. a module. The structured modules can then be introduced to the training programme (curriculum) and provided to students in an order dictated by that programme.

The required granularity of materials was obtained thanks to the flexibility of SCORM (ADL, 2009). It allows materials to be structured in any way, including in different hierarchies. For instance, the entirety of the material may be contained in one technical component or many technical components may comprise the entire material. In materials constructed for the operational needs of the centres, a highly granular approach was adopted, i.e. an assumption that the technical equivalent of a learning object shall be the smallest SCORM aggregation component, namely SCO (Sharable Content Object) (Balatsoukas, 2008). In technical terms, it means that the material of one learning object is contained in one html file organizing the content in various ways (text,

photos, films) (see fig. 1). The amount of content possesses a volume which enforces several minutes of study per learning object.

3.4 Repository and Adaptation of Content

Compilation of new material from already existing solutions to the training requirements identified by the centre is possible because the educational materials have an appropriate structure and technical form. Furthermore, they are stored in a content repository, which allows us to compile new materials without any technical knowledge of the person who conducts such an operation. Such a need was identified during the creation of the centres. It was not possible to assume that the trainers will possess a level of technical competency which would allow them to autonomously compile materials at the SCORM level. Therefore, the Content Repository Tool was implemented, which facilitates the storage of content while preserving its hierarchical structure and enables modification of its structure by the tool itself (Marciniak, 2014).

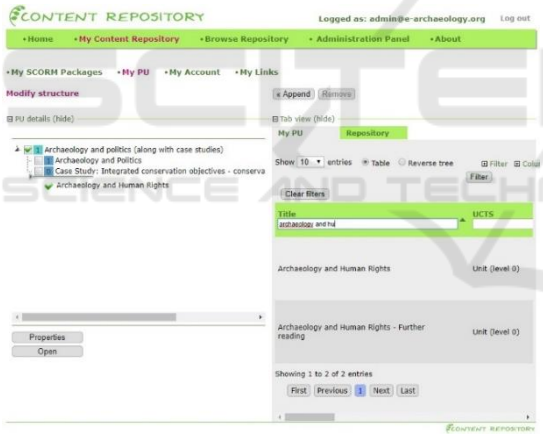

Figure 2: Browsing materials in the repository.

It is possible to remove elements of existing components, reposition the elements between components or create new ones with the use of components stored in the repository. As opposed to many tools used to build, e.g. OER, the system allows not only the storage and search of materials (fig. 2), but also the compilation of them with drag-and-drop functionality (fig. 3). During the compilation of new material, it is possible to use content of various degrees of granularity (modules, units, learning objects). It is also possible to access the technical assets of the learning objects, i.e. files such as graphical files (jpg, gif), html files and multimedia files (mp4, mp3).

Because the Centers of Integrated Teaching Excellence have a dispersed structure, i.e. they are managed and maintained by several interconnected entities, the repositories form a network with a master-slave architecture (Fig. 4).

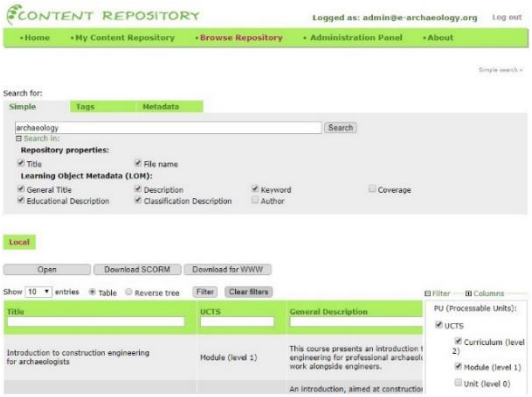

Figure 3: Compilation of new components.

The repositories of each centre (slave repositories) accommodate content used during training sessions in the protection and management of cultural and natural heritage, in the language in which the training is conducted. Such a repository may also store content on other topics developed or acquired by the centre, or materials from the central repository which are considered as necessary in the ongoing activity of the centre. The central repository (master repository) termed the E-archaeology content repository (E-archaeology, 2019), which, apart from materials relevant to the management and protection of cultural and natural heritage, contains materials on the protection of archaeological heritage and introductory materials on archaeology for engineers and engineering for archaeologists. Materials in the repository are available in multiple languages: English, Spanish, Portuguese, Italian, Polish, Latvian, German, Norwegian and Turkish. During the compilation of new materials, the trainer may refer to the contents of the local and central repositories.

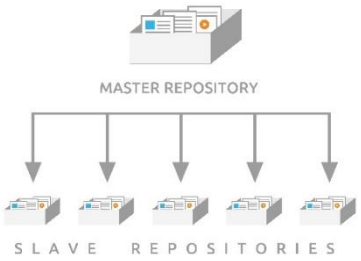

Figure 4: Architecture of repositories created for the needs of the Centers of Integrated Teaching Excellence.

3.5 Organisation of Training and Rules of Sharing Educational Materials

The varied mode of conducting training, open or closed character thereof and various roles fulfilled by the trainer in a course require the use of various tools helpful in conducting training. Because the centres are maintained by various entities, it was assumed that training in scheduled and open access on an e-learning platform modes may be conducted with the use of various e-learning platforms (such as Blackboard or Moodle). The intent of the centres was also the idea of sharing materials in the open mode via a portal promoting training, commonly accessible to all participants (hep.e-archaeology.org) or directly on websites of the institution maintaining the centre.

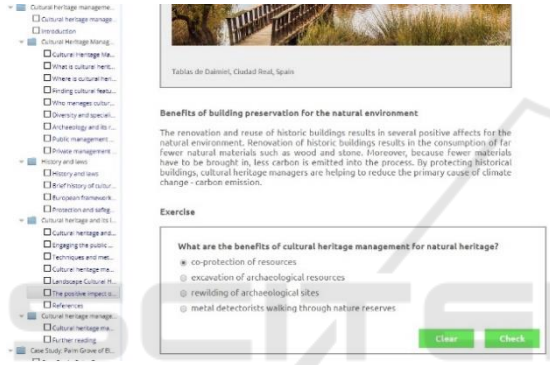

Figure 5: E-learning module launched on the Moodle platform.

The need of adapting the content to the needs of various target groups and the necessity of sharing it via various platforms provided an additional challenge in relation to the technical form in which the materials are distributed. The development of training educational materials requires flexible compilation and downloading of materials, which is provided by the tool used for constructing the repository. Launching these materials on various platforms also requires saving them after downloading in a technical form, which ensures preservation of their hierarchical structure. Non-fulfilment of that requirements would shift the responsibility for recreation of the hierarchical structure of the materials on the target platform to the trainer. In the case of e-learning platforms with a content management module, these activities would be possible in spite of their labour-intensive character. In the case of open sharing of content on the website, the recreation of the structure of the materials would require an amount of effort comparable with website development.

Figure 6: E-learning module shared via a website.

The aforementioned requirement is fulfilled thanks to software functionalities with which the content repository was built. Content Repository Tool enables downloading compiled content as SCORM packages, or as HTML presentations. The first form allows the course to be launched on e-learning platforms (Fig. 5), the other provides the possibility of integrating the course into any website and launching it with the use of internal navigation mechanisms embedded in the course (Fig. 6). That way, the same educational material is distributed with the use of various media with a guarantee of preserving its hierarchical structure and cohesion.

4 RESULTS

4.1 Training Programmes and Their Characteristics

The training programmes were developed in each centre taking into account the local conditions and addressing the identified needs of each target group. Syllabi were prepared for training, in which the target group was identified, along with the time frame of the training, the role of the trainer, the rules of group work and communication, and the stage of the training at which educational materials are to be handed over to the students. The amount and topic of materials depends on teaching effects defined for the training. Their form and volume depends on the training timetable, i.e. how the materials are provided to student during training (all materials are available at the beginning, materials are distributed in a sequence as progress is being made). Sample training programmes with their basic parameters are listed in Table 3.

Table 3: Sample training programmes.

Training programme	Target group	Basic parameters
Introduction to archaeological and cultural heritage	Professionals from natural heritage sector	Scheduled Last 20 days Online forum
Introduction to natural heritage	Professionals from archaeological heritage sector	Scheduled Last 30 days Online forum
Introduction to a joint management of natural and cultural heritage	Professionals in both sectors (policy making or environmental advocacy)	Scheduled Last 1 moth Online forum
An Integrated Approach to Natural and Cultural Heritage	Professionals in both sectors	Scheduled Last 6 weeks Group project
Introduction to integrated protection and management of natural and cultural heritage	Professionals in both sectors	Scheduled Lasts 10 weeks Online forum Individual project
Heritage and participative conservation	Professionals in both sectors	Open access

4.2 Use of Educational Materials in Training Programmes

As described in chapter 3, the materials stored in repositories have a hierarchical structure and, because they are modular, each of their components can be used multiple times in various courses. The choice of materials for each training programme depends on the topic of the training and the character of the target group. Materials were selected in accordance with the substantive key; however, the difficulty of the materials was also taken into account during the operation. When the materials contained in the module were treated as not important or too difficult from the point of view of a given target group, the modules were simplified, i.e. the components (units) which were not appropriate for a given programme, were removed. Similarly selected were components of case study type. In certain programmes, they were selected taking into account the legal and cultural context of the recipient of the training (e.g. Introduction to archaeological and cultural heritage); in other cases, it was the opposite, case studies were meant to illustrate problems different from the ones known by the student and therefore they referred to a context different from the one known by the student (eg. An Integrated Approach to Natural and Cultural Heritage). This example is a good illustration of how each training programme can be used without modification, when organising courses in other countries or regions or, more generally, how they can be used for student groups which have different needs stemming from their own experience. In general, the programme developed by one centre can be used in another, because that was the primary intent behind the competency centres. When changes in a programme are not necessary, it is sufficient to simply use an appropriate language version of the material and launch the training. The example with the role of case studies in the training programme shows, however, that changes in certain programmes may be necessary. In this case, the use of a programme for another group of recipients will require localisation exceeding just the scope of the language version. Thanks to the exchange of materials and technical capabilities of the software with which the repository was built, compiling new materials for the purposes of localised courses can be done in a matter of minutes.

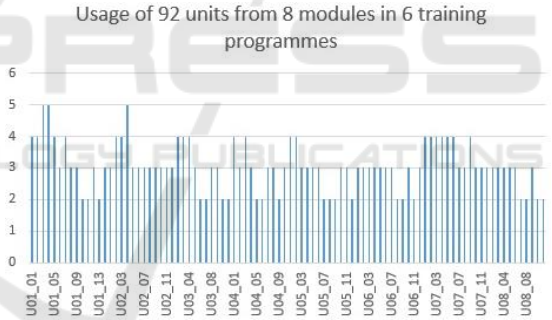

Figure 7: The use of materials from the repository in example training programmes.

Fig. 7 presents the use of materials from the repository in sample training programmes. The chart shows that no training course exhausted the whole range of educational materials developed during the operation of the competency centres. This is natural because the content involved issues on two complementary fields and was directed to various target groups. It is worth noting that components (units) of the same module were used in training programmes to different degrees (see module Cultural heritage management for nature heritage managers). This means that, while developing the training programme, the content was selected in accordance with the educational needs, and the difficulty of materials was based on the

characteristics of the target group. These choices also resulted from the schedule of individual training courses. Partial use of the components of individual modules referred primarily to case studies but also to units of a theoretical nature.

5 CONCLUSIONS

The solutions used in Centers of Integrated Heritage Teaching Excellence for the purpose of adaptation of training programmes regarding topics of complementary fields show that the flexible creation of new and the adaptation of existing training programmes requires an appropriate structure of educational content on the basis of which the training is conducted. It is also necessary to use appropriate tools with which the compilation of new content is possible without the need to employ IT specialists. The proposed model can be used in the organisation of any training courses in which there is a need to introduce changes in the subject matter, scope, duration, difficulty or supported learning styles.

The modularisation of content, appropriate structure, and technical form thereof facilitate its multiple use in various training programmes. The analysis of whether such characteristics of educational materials is expected should always be conducted before such materials are created. Choosing inappropriate technical tools and processes of creating digital materials may lead to obtaining materials which are too large, i.e. which aggregate too many content components, therefore the cohesive components may not be easy to "carve out" from the source material and use outside the original context. This may also lead to obtaining materials which are too granular, namely ones where small content components are stored as separate assets and during their repeated use, require structuring with the use of e-learning platform tools via which they will be distributed to students. Each decision regarding the expected form of materials should result in the choice of appropriate technical tools and support to content creators which allows them to create materials of appropriate methodological rigour.

ACKNOWLEDGEMENTS

This work was supported in part by the Erasmus+ project: "Innovative format of education and training of the integrated archaeological and natural heritage" (2014-1-PL-KA202-003565).

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