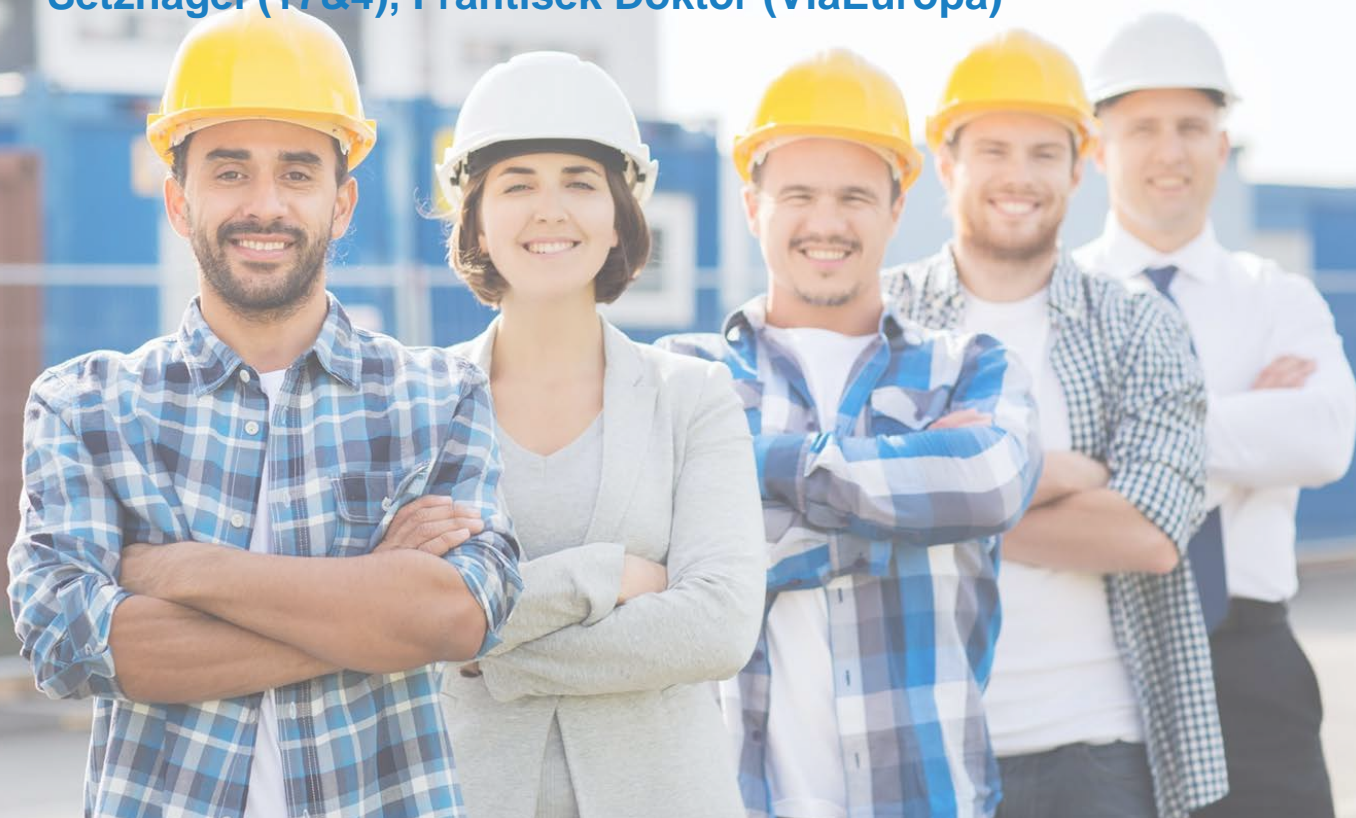


## **DELIVERABLE: 2.7**

Developed e-learning content for the training programmes in the targeted countries

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Setting up national qualification and training scheme for craftsmen in the Czech Republic and developing the further offer of training courses in Slovakia, Austria and Bulgaria.

Grant Agreement Number: 785036  
CraftEdu

Date of delivery: 01/2022



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 785036

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## Content

1	SUMMARY OF THE DELIVERABLE .....	3
2	INTRODUCTION.....	4
3	SELECTION OF FORMAT FOR E-LEARNING COURSES.....	4
3.1	<b>Review of available tools .....</b>	<b>4</b>
3.1.1	Review basics.....	5
3.2	<b>LMSs review.....</b>	<b>6</b>
3.2.1	Moodle .....	6
3.2.2	Courselle.....	7
3.2.3	Canvas .....	8
3.2.4	TalentLMS.....	9
3.2.5	Schoology .....	10
3.2.6	Google Classroom.....	11
3.2.7	Litmos .....	11
3.2.8	Docebo .....	12
3.2.9	iSpring Learn.....	13
3.2.10	Blackboard.....	13
3.2.11	Chamilo.....	14
3.2.12	Asentia.....	15
3.2.13	Thought Industries .....	16
3.3	<b>Description of the selected format of e-learning.....</b>	<b>16</b>
3.3.1	Software environment for creating courses (backend).....	17
4	DESCRIPTION OF THE CRAFTEDU COURSE DATABASE (FRONTEND).....	19
4.1	<b>Language variability .....</b>	<b>19</b>
4.2	<b>Description, objectives of the courses.....</b>	<b>19</b>
4.3	<b>Professional focus of the courses.....</b>	<b>19</b>
4.4	<b>Structure of the courses.....</b>	<b>20</b>
4.4.1	Text training materials.....	20
4.4.2	Video courses and lectures.....	20
4.4.3	E-learning.....	20
4.5	<b>Interface procedures and controls .....</b>	<b>20</b>
4.5.1	Step 1: Course registration procedure .....	21
4.5.2	Step 2: Procedure for obtaining study material .....	22
4.5.3	Step 3: Procedure for obtaining video material .....	23
4.5.4	Step 4: E-learning - registration and e-learning completion process .....	24
5	CONCLUSION AND NEXT STEPS.....	28
6	REFERENCES.....	32
6.1	<b>Used online resources.....</b>	<b>32</b>

## 1 Summary of the deliverable

The document presents the development of on-line training programmes and e-learning content for craftsmen within the second work package (WP2) of the CraftEdu project. The WP2' objectives are to develop learning outcomes and training programmes including e-learning for targeted craftsman professions. The objective has been achieved and the e-learning part of the training is described in detail below.

The work on e-learning components includes the development of learning texts for students and guidebooks for trainers that had been created earlier in the project. A database of courses for participating countries, covering these training materials, has been set up. The database includes all CraftEdu "student's handbook" files, teaching videos and e-learning materials.

In order to find the most suitable e-learning environment to present the materials available in the database, a search study was performed to select fitting online environment for sharing the created study materials and for managing CraftEdu courses. Although dozens of usable options were identified, it was decided to create a new e-learning tool, based on open source solutions, which will be tailored to the needs of the CraftEdu project. This internal solution has in the end required the same or lesser work effort, than adapting a third party tool.

The database and the e-learning environment have been integrated and are operational now. Online courses in the Czech Republic have been fully completed. In other project countries, online courses are nearing completion. The course database is linked to the data files and created videos ("student's handbook", "trainer's guidebook", video courses, e-learning courses, etc.)

## 2 Introduction

In the Work Package 2 (WP2), the national working groups, set up in the Task 2.1.1, and affiliating employers and VET providers have been developing qualification (QS) and assessment standards (AS).

In the previous phases of the project, curricula and study documents were created for the students and trainers. The current part of the project focuses on creating e-learning content for educational programs in the target countries.

A study of the available software tools was performed in accordance with the point 2.3.1 of WP2 – Development of software environment. The available tools were not fully usable for the purposes of the CraftEdu project; therefore, a new database was created.

The core of the software solution is based on October CMS which is built on PHP Laravel framework. All components of the software are based on open source technology. The basis of the October CMS was extended by a programmer with the required database entries, courses and tests management and basic e-learning environment. The frontend provides the list of open courses, a possibility to register for new users, browse option for open courses and e-learning lessons and tests (quizzes).

In accordance with the point 2.3.2 of WP2 – Development of content for the user, the training courses have been set up in the selected countries (language variants). CraftEdu courses include access to the study documents, created in previous parts of the project, links to video lectures and links to e-learning content. The e-learning courses include practical exercises, stop/go questions and multiple-choice questions for self-evaluation.

The prototype courses for the Czech Republic were created and tested. Courses for the other countries were created and will be added to the database.

## 3 Selection of format for e-learning courses

To select the appropriate form for publishing the e-learning content of training programs in the target countries, a method review was conducted. The most suitable one was chosen out of the examined methods.

### 3.1 Review of available tools

There are various definitions of e-learning. Lee & Lee state, that “E-learning is an on-line education defined as the self-paced or real-time delivery of training and education over the internet to an end-user device.” [1], whereas Marquès defines e-learning as “...distance education through remote resources” [2]. More comprehensive definition is provided for example by Bermejo, who states that “E-learning is education that uses computerized communication systems as an environment for communication, the exchange of information and interaction between students and instructors.” [3] Very comprehensive article called Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework on this subject was published by Sangra, Vlachopoulos and Cabrera, stating that the topic of e-

learning is so comprehensive, that creating a single, inclusive definition of e-learning, that would be widely accepted, is very difficult [4].

The semantic questions about e-learning are not part of this review though. For the purpose of the review, e-learning is understood as a process of education with the use of information, communication and digital technologies for creation and distribution of education content, communication between students and lecturers and education management.

Learning management system (LMS) is an electronic or digital platform. Its main purpose is to realize e-learning activities. It is not widely defined, because as Kats states, it is not "...productive to try to find one all embracing 'essential definition' of what LMS is..." [5, pp xvii]. E-learning tools are any tools, used for realizing e-learning activities. One of the definition states, that such tools are usually very project specific or are united into platforms, i.e. LMS.

### 3.1.1 Review basics

The main aim of this research is to review main e-learning possibilities across the market with the relation to the project. As defined above, e-learning is a process. Therefore comparison of e-learning tools is only relevant project-wise. On the other hand, comparison of specific tools might not be relevant enough, due to their granularity and complicated categorization. This might not fit to the needs of the project and could provide too many dead-ends, which would not be relevant. The best way to approach the topic is to do a review of existing LMS, along with their tools description and comparison. The best value for future decision-making process will be achieved in such a way.

Over 50 LMSs were identified and briefly reviewed. Based on this preliminary research, following LMSs were examined more thoroughly:

1. Moodle
2. Courselle
3. Canvas
4. TalentLMS
5. Schoology
6. Google Classroom
7. Litmos
8. Docebo
9. iSpring Learn
10. Blackboard
11. Chamilo
12. Asentia
13. Thought Industries

Each LMS was described in following unified pattern (paragraphs):

- General background and history;
- License and pricing;
- Basic description, deployment, strengths and weaknesses.

While difficult to compare, as each LMS has its unique features, the key aspects and features were identified and outlined in a unified table. The assessed features were as follows:





- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• Name</li><li>• Web</li><li>• County</li><li>• (Comment)</li><li>• Platforms</li></ul>  | <ul style="list-style-type: none"><li>• Features</li></ul>  |
| <ul style="list-style-type: none"><li>• Language<ul style="list-style-type: none"><li>• English</li><li>• Czech</li></ul></li></ul>  | <ul style="list-style-type: none"><li>• Roles</li><li>• Permissions</li><li>• Teams</li><li>• Registration</li><li>• Enrolment</li><li>• Attendance tracking</li><li>• Course authoring</li><li>• Course upload</li><li>• Tests</li><li>• Surveys</li><li>• Assignments</li><li>• Discussions</li><li>• Chat</li><li>• Grading</li><li>• Gamification</li><li>• Certifications</li><li>• Calendar</li><li>• Block IP</li><li>• Anti-spam</li><li>• Anti-virus</li><li>• Offline support</li></ul> |
| <ul style="list-style-type: none"><li>• Learning methods<ul style="list-style-type: none"><li>• Asynchronous self-paced</li><li>• Asynchronous led</li><li>• Virtual classroom</li><li>• Blended learning</li><li>• Discussions</li><li>• Chat</li><li>• Grading</li><li>• Gamification</li><li>• Certifications</li></ul></li></ul> |   |

### 3.2 LMSs review

LMSs review is based mainly on the internet research and authors' personal sources. As a main source, a high-quality internet web page dealing with e-learning industry was used (<https://elearningindustry.com/>). Basic information about all reviewed LMSs was gathered and then cross-references with the official LMSs sources (as a rule, official web pages). The data were cleaned, updated, and corrected, according to the review requirements. For every reviewed LMS, the home page print screen was included, although it is merely informative, as it doesn't explain any of the LMSs features. Information presented in following chapters is mainly based on the trusted reviews of described LMS.

In the following, the compared methods are listed. The detailed overview and comparison are included into the appendix to the document.

#### 3.2.1 Moodle

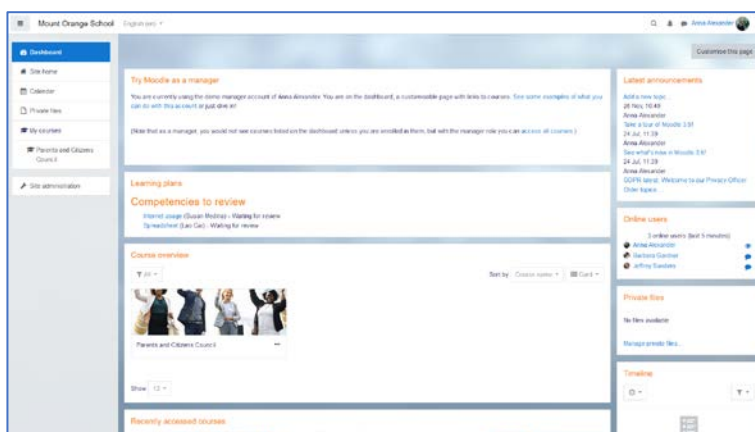
Moodle is a project coordinated by Moodle HQ and is financially supported by a network of over 80 companies worldwide. It is currently used by many institutions, regardless of their size. It has over 100 million users. It has long history, beginning in 1970s as an idea and in 1999 as a prototype. As of 2015, Moodle is considered being the most popular LMS in the world.

Moodle is provided freely as Open Source under GNU General Public License. There are currently 4 pricing plans for Moodle. User can either (i) download a standalone self-hosted



platform for free or (ii) use Moodle as a cloud service for free for up to 50 users. Besides of these two options, there are (iii) specific plans starting from 49 EUR/year for 50 to 500 users. The main difference, compared to a free plan, is the additional installation of popular Moodle plugins and advanced themes. For power use, there is (iv) another option for unlimited users, extended by the analytics and reporting features, integration with other systems and extra custom features. The price of this plan is custom tailored.

Figure 1 – Screen of tool – Moodle (<https://school.demo.moodle.net/my/>)



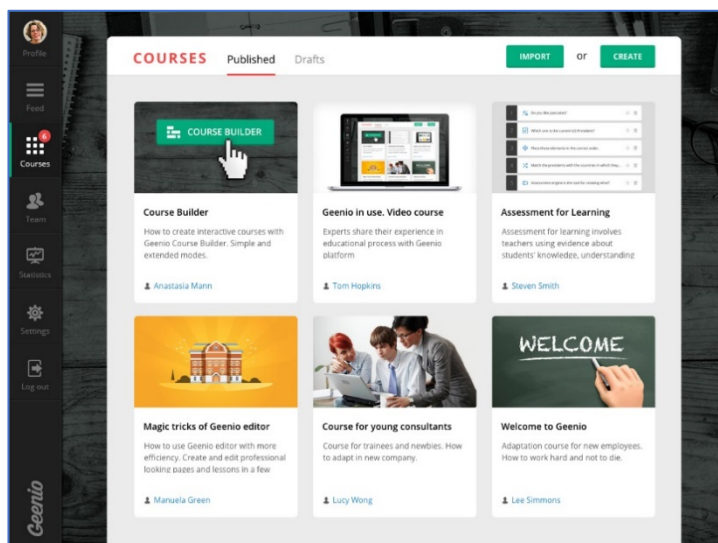
Moodle is a complex system with the all most wanted LMS features, which can be further extended either by code modification or by plugins. It can be used either as on premise or a cloud system. Its strength is its wide usage throughout the world. It is a tested and reliable LMS. While easy to use, the on premise deployment might be technically challenging. Because of its Open Source basis, there might be a lack of technical support in case it is needed. There is also some UI design limitation, as it is a LMS with history and long-term development. There are many plugins and extension available for Moodle, which might prove useful, but also confusing for inexperienced users.

### 3.2.2 Courselle

Courselle (formerly known as Geenio) is both company and product. It was created in 2012 (as a Geenio) and then rebranded as Courselle in 2018. The authoring team behind Courselle has great experience in e-learning industry and Courselle was created mainly as a reaction on the demand for this specific tool which was not available on the market.

Courselle is available either under a free or paid proprietary license. There are currently 4 pricing plans for Courselle. (i) Free plan allows 10 users and 5 courses. (ii) Starter plan allows 20 users and unlimited sources for 490 USD/year. There is also (iii) business plan for 3300 USD/year for up to 300 users and (iv) special tailored enterprise plan with individual calculation for 500+ users.

Figure 2 – Screen of tool – Courselle (<https://elearningindustry.com/directory/elearning-software/geenio-lms>)



Courselle is a complex system with all most wanted LMS features. It is cloud based and is provided with powerful content creation system. Another key aspect of Courselle is a learning management tool, allowing enrolling, reporting, integration and customization for the users. The third key pillar of Courselle is messaging and collaboration tool. Besides that, not many information is freely available, but the LMS allows user to try demo version of its services. The design UI of Courselle is very clean and up to date.

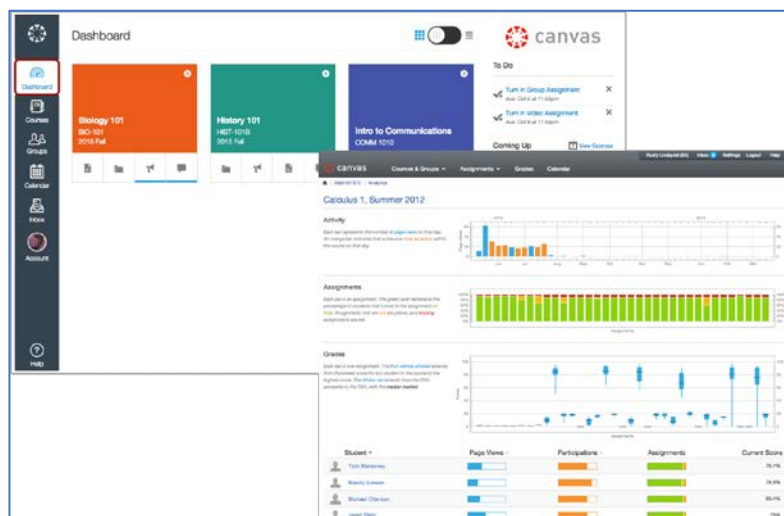
### 3.2.3 Canvas

Canvas is a product of Instructure company, which specializes in creating tools for making teaching and its processes easier. Canvas has more than 18 million users worldwide and is continuously growing. The project was founded in 2008 and launched in 2011. It was selected by Cisco Networking Academy to power “the world’s largest classroom”.

Canvas is provided freely as an Open Source. It is free for use for student and teachers, but it is necessary to register and the free plan only offers the basic functions. It is then necessary to upgrade the account to freemium account, unlocking all necessary function. The pricing is individually calculated.



Figure 3 – Screen of tool – Canvas (<https://www.canvaslms.com/try-canvas>)



As an Open Source system, Canvas has its limitations in terms of technical support. On the other hand, the LMS is very clean and easy to use, although reported to be very technical with steeper learning curve, probably because of a contextual heavy UI. Many users are reporting simply no weaknesses of this system though. The grading system is probably not that good as in other LMSs, but Canvas is continuously developing. Canvas LMS has a cloud deployment model.

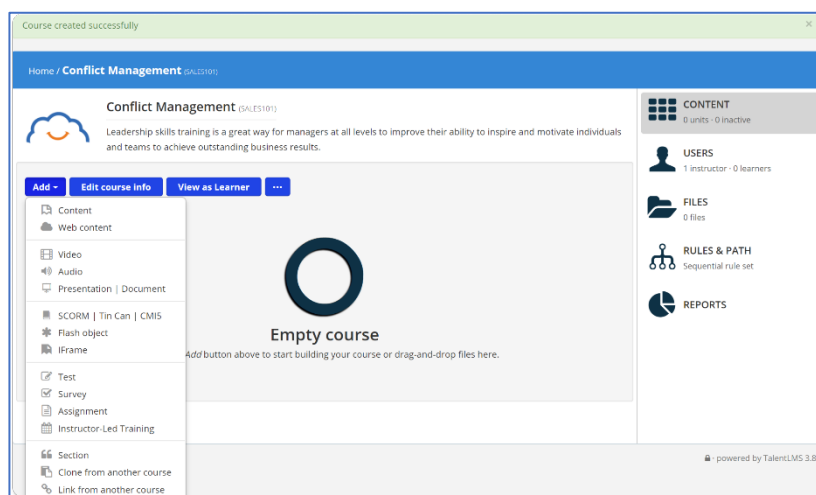
### 3.2.4 TalentLMS

TalentLMS is swiftly expanding LMS solution of a company called Epignosis. It has over 4 million users base. While still being relatively young product, it has already won many awards. The product is made specifically for modern society with no compromises.

TalentLMS is available either under a free or paid proprietary license. There are currently 5 traditional and 4 unlimited pricing plans. While traditional pricing plan usually limits license to certain number of users (from 5 to 1000) and courses (from 10 to unlimited), unlimited plans are only limited by active users per month. Traditional plans cost from 0 to 349 USD/year, while unlimited plans cost 79 to 379 USD/year. The only other difference between plans are additional features like custom reports, automations, success manager and SSL for custom domain.

TalentLMS is full on features, it includes almost every possible feature or tool. While it is sometimes referred as a harder to master (from the teacher perspective), its UI is well designed and clean, although it could be more visually appealing. The whole system is very complex and is being continuously developed. It is also very tightly integrated with mobile devices. Tutorials for TalentLMS seem sometimes confusing, but are consistent and extensive. Customer service is apparently not of a high quality. TalentLMS has a cloud deployment model.

Figure 4 – Screen of tool – TalentLMS (<https://www.talentlms.com/blog/how-create-online-course-talentlms/>)

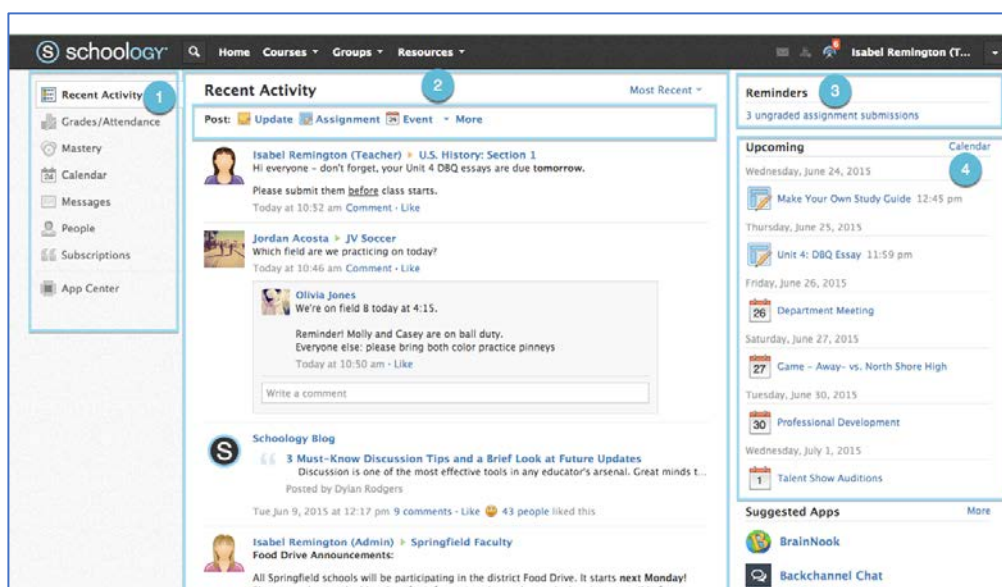


### 3.2.5 Schoology

Schoology is a simple lightweight LMS system, oriented mainly on K-12 (primary education in the United States). It has a user base of over 12 million users. It was founded in 2009. Although it has a potential to be one of the best LMSs on the market in the future, as of July 2018, Schoology is no longer developed for higher or other education and focuses only on K-12 level.

Schoology is cloud deployed. The license is proprietary. It is initially free, but has to be paid by 10 USD/month or by a custom one-time implementation fee.

Figure 5 – Screen of tool – Schoology (<https://mfeldstein.com/schoology-strongest-lms-youve-never-seen/>)



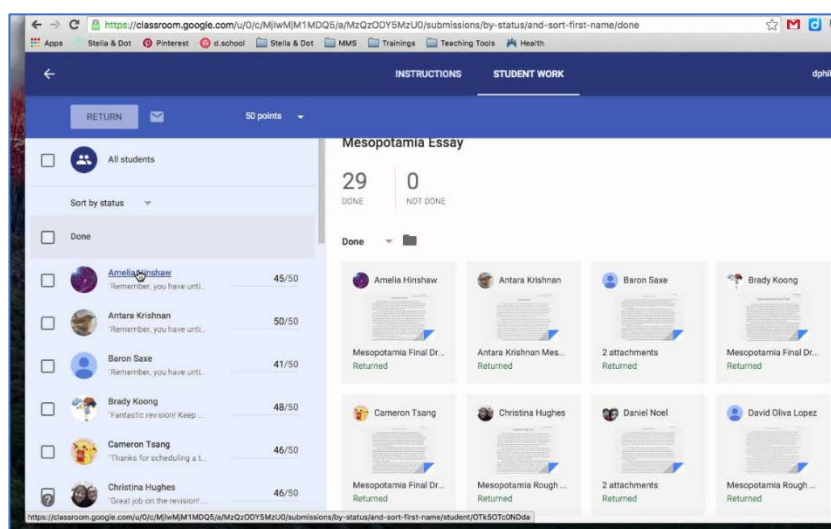
While very easy to use and interesting, this LMS is rather feature light and only support primary education aspects. It is therefore not very relevant to the project, but was included in the review, as it is a very highly rated LMS for its purpose. Its features mainly work as a digital repository, DMS, authoring and testing/grading tool. Schoology is cloud based.

### 3.2.6 Google Classroom

Google Classroom is a service, which is part of G Suite for Education from Google. This provides users with various collaborative tools for e-learning. G Suite for Education has over 80 million users, while Google Classroom is being used by more than 40 million students and teachers. It is mainly focused on the American primary education (K-12).

G Suite for Education is free for schools, based on institutional subscription. The pricing for other institutions and for institution outside google market (i.e. Czech Republic) is not available.

Figure 6 – Screen of tool – Google Classroom (<https://hiverrhq.com/blog/edtech-teacher-google-classroom/>)



G Suite for Education is simple to use with google-like services. The integration is thorough to other google services like Gmail, Drive, Tasks etc. It is mostly focused on the American market. It is probably relevant only to the companies, which already use widely google services. Because of that, it is most likely not a solution for the project. From the nature of Google services, google Classroom is cloud based.

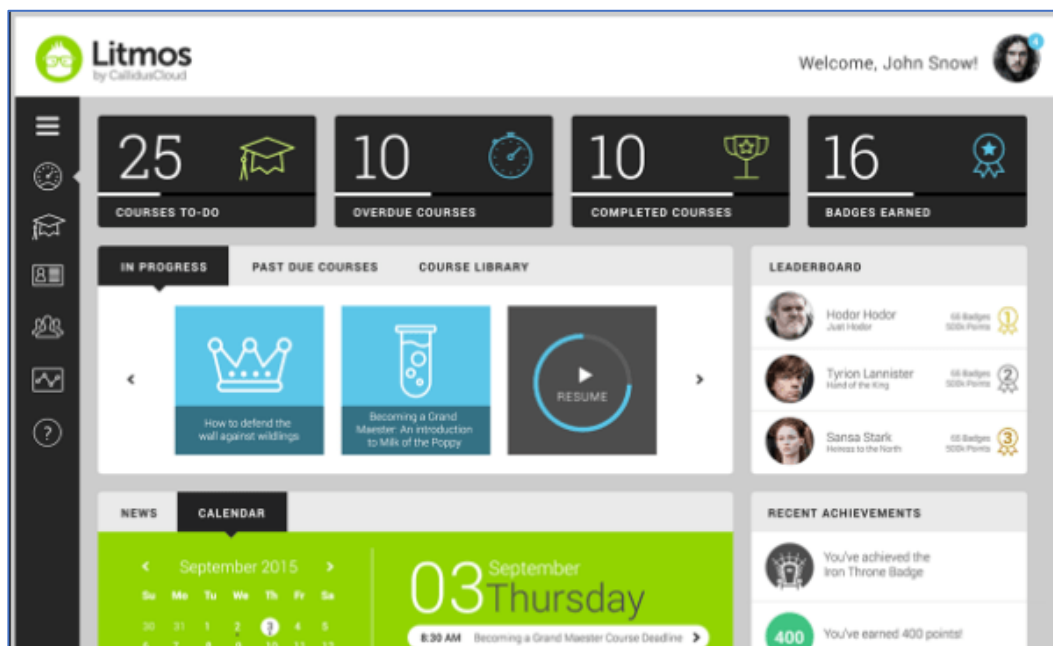
### 3.2.7 Litmos

Litmos is a professional solution of SAP Litmos for the integrated education, especially on a corporate level. It has over 11 million users and has received various awards. It was developed to meet the demands of a corporate education as a tool for human resources, compliance managers etc.

Litmos is a cloud based solution on a proprietary license. The LMS solution is based on the number of users. It costs 6 USD/user/month up to 500 users, 4 USD/user/month up to 1000 users and individual calculation is made for more than 1000 users.

Litmos is packed with features. As a secondary service, it provides (for a certain price) users with the access to the existing database of professional courses. It is a top professional service with only a few negative reviews. It has a cloud deployment model.

Figure 7 – Screen of tool – Litmos (<https://talentedlearning.com/lms-review-litmos-pro/#prettyPhoto>)

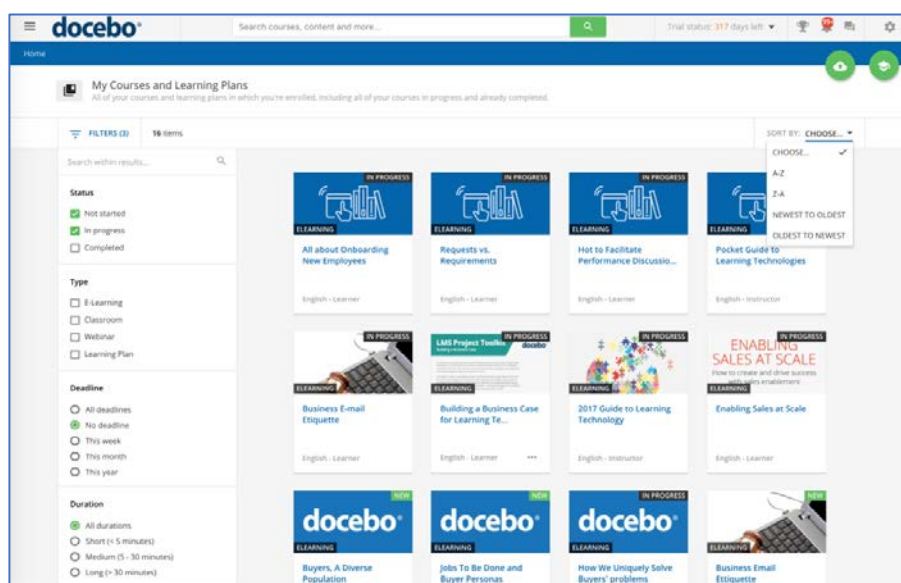


### 3.2.8 Docebo

Docebo is an enterprise learning ecosystem. It is developed by a company from Canada, but has its offices all over the world. It has over 6 million users worldwide and is considered one of the smartest corporate LMS in the world. It has gathered various awards.

The license of Docebo is proprietary. There are two paid plans for using Docebo. The first one (i) is limited to 300 active users and is limited on some support. The second solution (ii) is for bigger enterprises with no limits. The prices for both solutions are negotiable and not publicly available.

Figure 8 – Screen of tool – Docebo (<https://elearningindustry.com/directory/elearning-software/docebo>)



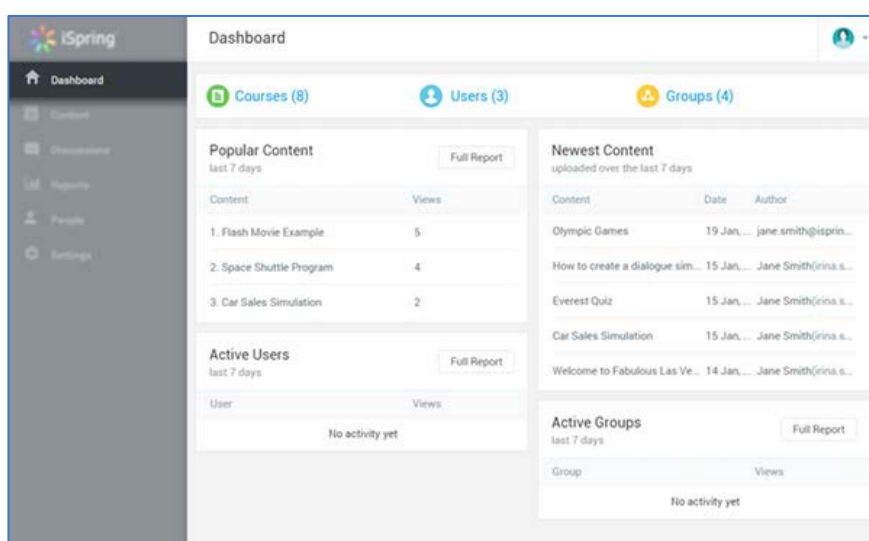
Docebo has a cloud based deployment. It includes all the thinkable features and is noticeable for its implementation of artificial intelligence. Based on the available reviews, there is nothing to complain about the system. It is said to be rather expensive.

### 3.2.9 iSpring Learn

iSpring Learn is a LMS developed by the American company iSpring. It has a long tradition since 2001 and is continuously growing. iSpring Learn is an award-winning e-learning platform for all kinds of companies. It has a user base of thousands of users, but is continuously growing. iSpring Learn is a part of a larger iSpring Suite, which extends LMS by introducing other tools for creating courses, quizzes and simulations.

iSpring Learn runs on a proprietary license. There are four pricing plans. (i) The first plan costs 3,66 USD/user/month and is for up to 100 users and 50 courses. There is only a basic technical support. (ii) The second plan costs 3 USD/user/month for up to 300 users and offer unlimited courses and a basic technical support. (iii) The third plan costs 2,82 USD/user/month for up to 500 users with the added premium support. (iv) The last plan is custom tailored for consumer needs for 500 active users. The mentioned iSpring Suite standalone lifetime license costs 770 USD.

Figure 9 – Screen of tool – iSpring Learn (<https://www.softwareadvice.com/lms/ispring-learn-profile/>)



iSpring Learn is mostly the tool for digital training portal. It promotes active employee, compliance, product and channel training. Because of that, it is not an ideal solution for the project, although might be viable, as it is very highly rated. It provides users with the standard features and besides a cloud deployment allows also on premise installations, if that is desired.

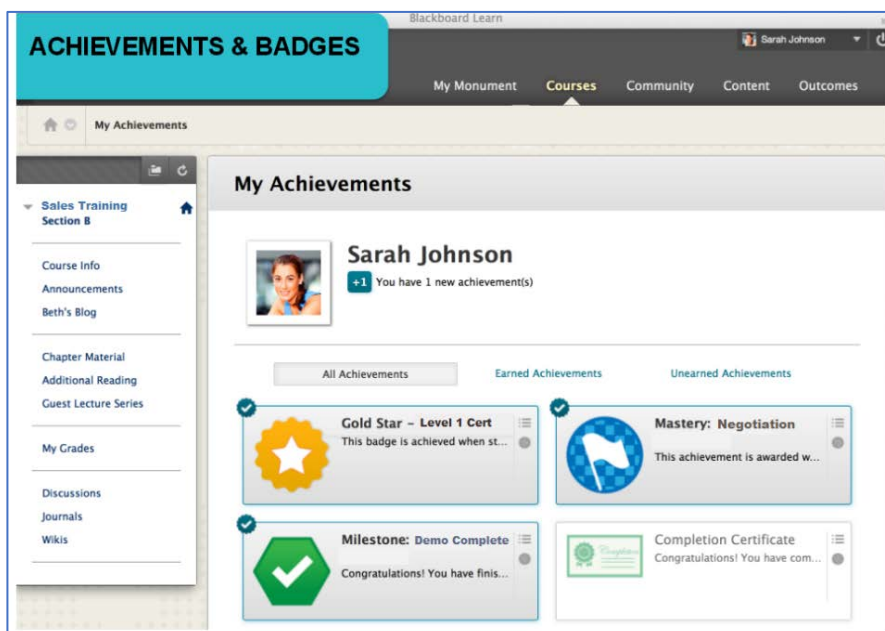
### 3.2.10 Blackboard

Similar to Schoology, Blackboard is simple LMS, providing solutions for not only primary, but also secondary and tertiary education. Company claims to have 20 years of experience with e-learning development. LMS is only a part of more comprehensive services of the company.



The pricing scheme for business use is not available freely and is calculated on individual basis. The license is proprietary.

Figure 10 – Screen of tool – Blackboard (<https://www.capterra.com/p/14500/Blackboard-LMS-for-Business/>)



Blackboard can be deployed either as a cloud service or as a device application. No further information is available. The user UI seems to be clean and efficient. The product is often perceived as an immature, but of high overall quality. It is often considered as a very simple to use, easy to navigate LMS.

### 3.2.11 Chamilo

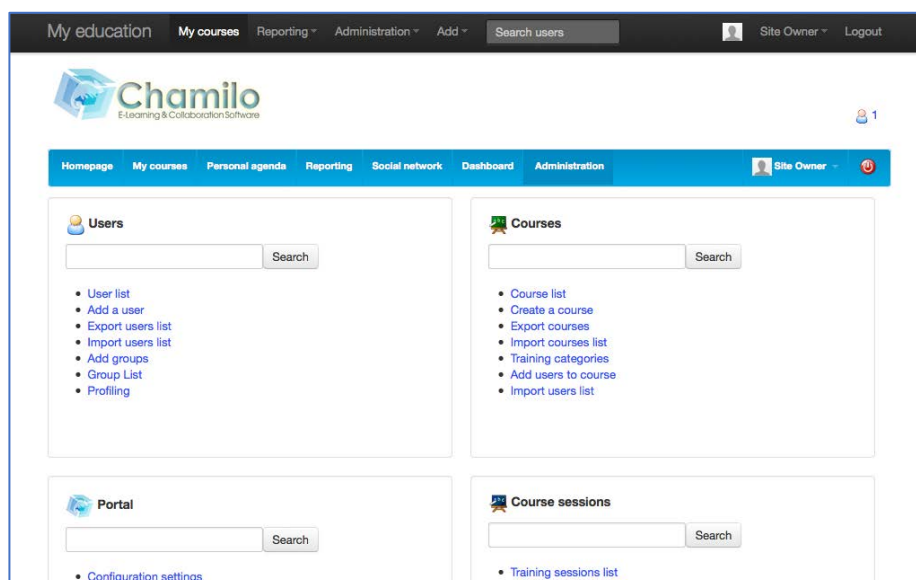
Chamilo is a popular e-learning and collaboration software, developed in Spain (it originated in Belgium in 2010, but moved to Spain in 2014) by Asociación Chamilo. It was based on Caroline project, first published in 2001 and put a strong emphasis on creating a free and platform independent software. Its development is based mainly on donations.

Chamilo is provided freely as Open Source under GNU General Public License. It currently only offers a standalone self-hosted solution, although some sources list also possibility of using Camilo as a service based on subscription. No official information of such a character was found though.

Based on its business model, Chamilo is mostly comparable to Moodle. It provides not only the LMS features, but also tends to work as a communication system. Its target groups are academic, freelance and public administration. It is valued based on its simplicity and a clean design, although some features still have to be evolved to be more efficient. LMS administration learning curve is considerably long. Compared to other LMSs, a user-base is not that extensive and therefore there are not so many plugins available.



Figure 11 – Screen of tool – Chamilo (<https://installatron.com/chamilo>)

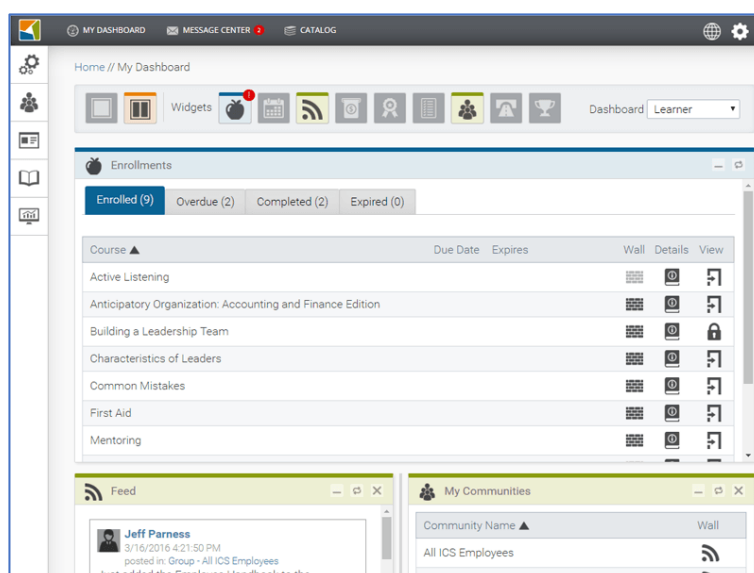


### 3.2.12 Asentia

Asentia is very powerful LMS for a corporate learning. Many times awarded tool is developed in the US. Asentia presents itself as a LMS with no compromises and many innovative concepts. Its main target group are large companies and administrations.

The license of Asentia is proprietary. Pricing models are not freely available, the price is calculated specifically for each customer, based on his needs and requirements. It runs as a service.

Figure 12 – Screen of tool – Asentia LMS (<https://www.asentialms.com/resources/>)

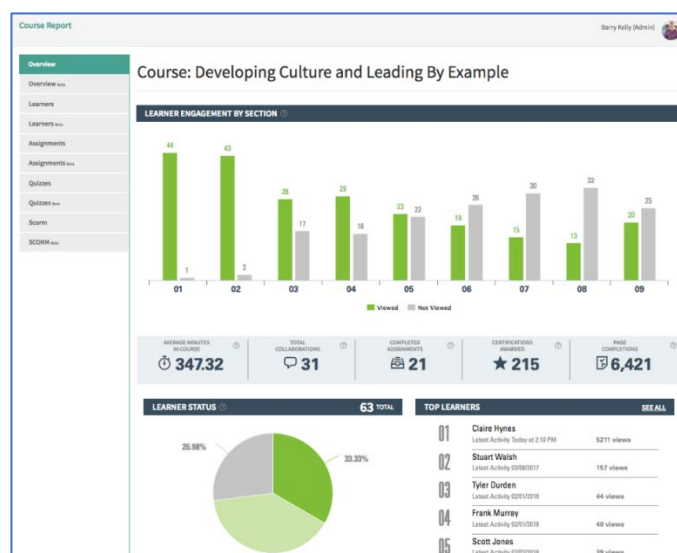


As a very user specific tool with tailored functionalities and pricing model, there is not much to say about Asentia. It covers all basic and advanced features of LMS. It is very customer oriented, with supposedly excellent support. It is easy to learn and customer-side simplified. The company constantly implement new system features based on the customer's feedback.

### 3.2.13 Thought Industries

Thought Industries is a company from the US, oriented on the developing learning platforms. It currently has two products - Learning Business Platform and Customer Learning Platform. The first one is focused on delivering education, the second one is focused on a customer training. For the purpose of this review, Learning Business Platform (LBP) was considered.

Figure 13 – Screen of tool – Thought Industries (<https://elearningindustry.com/directory/elearning-software/thought-industries>)



The license of Thought Industries LBP is proprietary. The tool runs as a service and the pricing is tailored based on customers' needs.

Thought Industries LBP is a very specialized tool, designed for those who want to monetize their educational product and are looking for the platform for this activity. It allows to create, deliver, sell and manage the content with all classical functions of LMS. It might be one of the best professional solution for this purpose on the market feature-wise. It is rather oriented on the larger companies and is often considered as easy to learn with hardly any drawbacks.

### 3.3 Description of the selected format of e-learning

There are many different LMSs on the market, with various purposes. The highest quality LMSs were listed in the review above. Besides that, there might be hundreds of similar platforms, but with less functionalities and with different concept and purpose. To choose the best LMS is not to find one with most numerous features, but to find one which best fits the requirements. The first step to choose LMS for any kind of activity is therefore to describe the required functions and processes. Then it is possible to find a software solution, which fits mostly to the defined description. It is often necessary to review the market possibilities as the first step to be able to specify the requirements as realistically as possible. For this purpose, our review has presented 13 best known LMSs with their features' comparison and brief description.

For the purpose of publishing e-learning within the CraftEdu project, it was decided, that the displayed systems are suitable, but it will be more beneficial to create our own system, which will fully correspond to the goals of the CraftEdu project.

Also it was decided to create our own database. The core of the software solution is based on October CMS which is built on PHP Laravel framework. All software components are based on the open source technology.

The basis of the October CMS was extended by a programmer with the required database entries, courses and tests management and the basic e-learning environment.

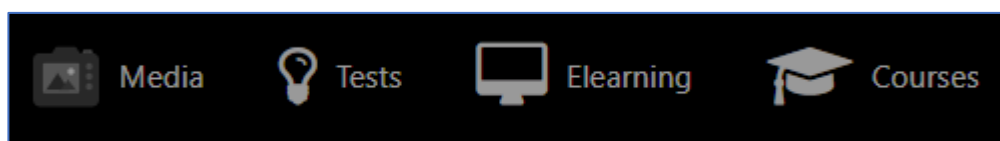
The October CMS backend was extended and is accessible according to the user levels defined by the Operational rules.

The frontend of the database is accessible at craftedu.eu subdomain: database.craftedu.eu. The frontend provides the list of open courses, a possibility to register for new users, browse option for open courses and e-learning lessons and tests (quizzes).

### 3.3.1 Software environment for creating courses (backend)

The new CraftEdu database (<https://database.craftedu.eu>) allows users to create courses and e-learning content. In the backend it is possible to create new courses which CraftEdu users can sign up. Furthermore, it is possible to create study and testing materials in the Elearning block, which can be used within the courses to deepen knowledge or to verify knowledge.

Figure 14 – database.craftedu.eu – Backend menu



In the database, each course can be described with a short text, which will be displayed to those interested in the course. The dates of online courses are set here, or it is possible to use the database as a login for offline courses.

Documents, media and links can be attached to each course. The course participant has all the necessary materials in one place.

Figure 15 – database.craftedu.eu – Course for window instaler – Backend (Bulgarian version)

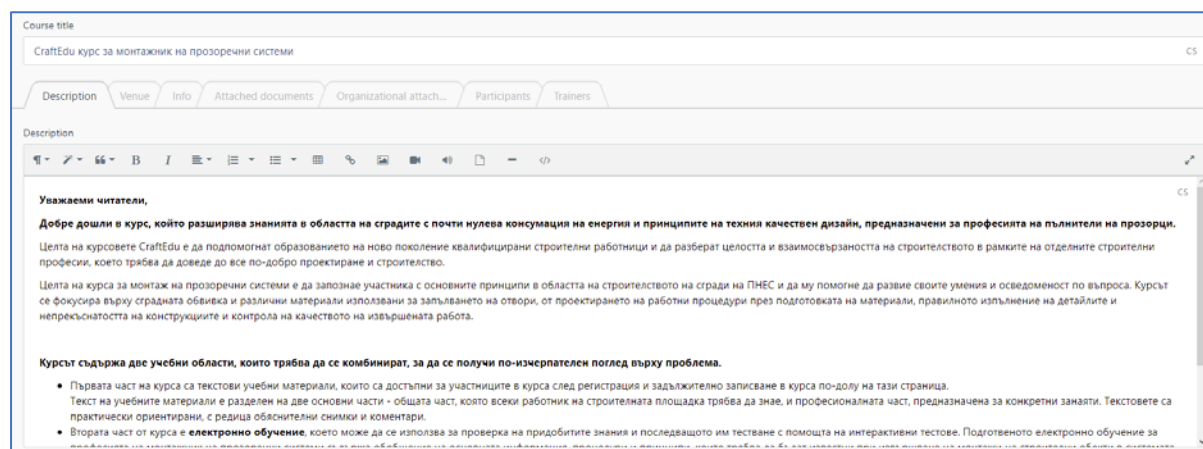
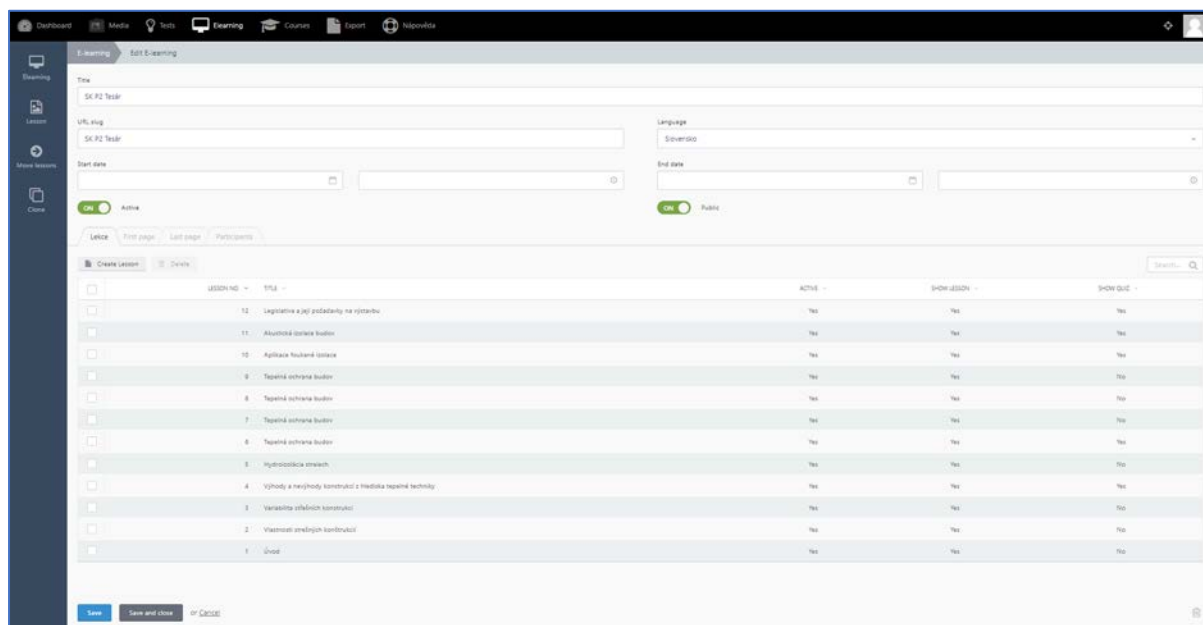
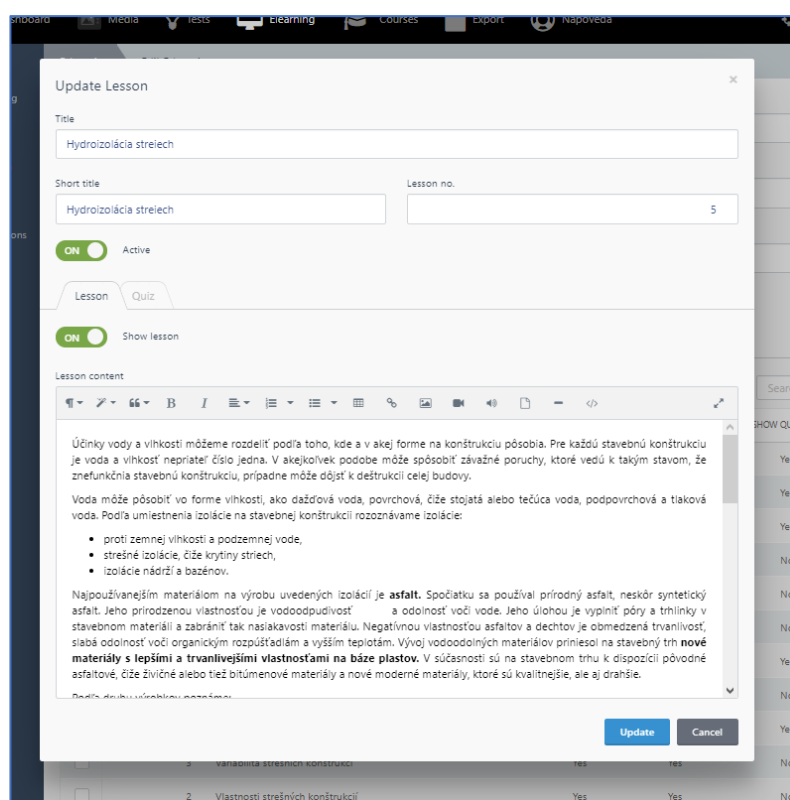


Figure 16 – e-learning – Backend (Slovak version)



Each e-learning course consists of pages. Text, images, spreadsheets, or videos can be displayed on a page. On the main page of the e-learning course there is a list of pages that the course contains, the number of pages can be changed arbitrarily.

Figure 17 – e-learning – Update form for e-learning page – Backend (Slovak version)



## 4 Description of the CraftEdu course database (Frontend)

A custom database has been created that meets the requirements of the CraftEdu project. The user has access to the database using a web application. The user has the option to view the available courses and to choose the course that is most appropriate for his professional qualification. After registration and login to the database system, the user can log-in as a course participant. The course participant has access to all the training materials, available in the CraftEdu database.

### 4.1 Language variability

The database is currently viewable in four language variants. Setting up national qualification and training scheme for craftsmen in the Czech Republic and developing the further offer of training courses in Slovakia, Austria and Bulgaria.

Supported languages:

- Czech;
- Slovak;
- German;
- Bulgarian.

### 4.2 Description, objectives of the courses

The main goal of the CraftEdu project is to create educational programs for craft professions in the field of buildings with nearly zero energy consumption (nZEB).

The aim of the project is to increase the quality of the performed construction activities and to increase the technological discipline and professional competence of the craftsmen. The aim of CraftEdu courses is to help in educating a new generation of qualified construction workers and to understand the integrity and interconnectedness of construction within individual construction professions, which should lead to the better and better design and construction.

### 4.3 Professional focus of the courses

The distribution of the courses varies by country, according to the current requirements and legal framework in each state. The following list shows the total range of the courses provided. CraftEdu provides 8 professions:

- HVAC installer;
- Carpenter;
- Low-voltage electrician;
- High-voltage electrician;
- Hydro-insulator;
- Windows Fitter;
- Chimney sweeper – Installation technician;
- Chimney sweeper - Inspecting technician.

#### 4.4 Structure of the courses

The purpose of the course for individual profession is to acquaint the participant with the basic principles in the field of construction of nZEB buildings and to help to develop his skills and awareness of this concept. The courses are focused on constructions, working procedures, technologies and materials, correct execution of details and connections of constructions, as well as quality control of the performed works. The courses consist of three parts, three learning areas. It is appropriate to combine these areas in order to gain a more comprehensive view of the issue.

##### 4.4.1 Text training materials

The first part of the courses is text training materials, which are accessible to course participants after registration and binding enrolment in the course, as shown below.

The study text of the training materials is divided into two main parts - the general part, which every worker on the construction site should know, and the professional part, which is intended for the specific trades. The texts are practically oriented, with a number of explanatory pictures and comments.

##### 4.4.2 Video courses and lectures

In addition, videos with lectures are available for professionals to deepen the knowledge received within the course. The link to the videos can be found on YouTube, during the course the listener will get links to the videos. Lecture videos are divided according to the thematic areas. The videos are prepared for a common theoretical part, which deals with an introduction to the nZEB topic, and for the specialized part dealing with individual professions.

##### 4.4.3 E-learning

The third part of the course is a system of e-learning, which can be used to verify the acquired knowledge and provides its subsequent testing using interactive tests created for the comprehensive areas of the topic. The prepared e-learning for professions contains a summary of the most essential information, procedures and principles that must be known when performing constructions in the nZEB-standard. A course participant can enter the e-learning content using the links provided after registering for the course.

#### 4.5 Interface procedures and controls

The following chapter describes in detail, how the database is controlled. It describes how the user registers for the course, obtains study materials and links to the teaching content.



#### 4.5.1 Step 1: Course registration procedure

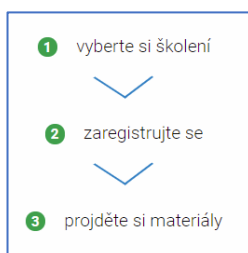
Those interested in registering for a CraftEdu course can register on the registration page. Login is available at:

- <https://database.craftedu.eu/cs> - for the Czech Republic (Czech)
- <https://database.craftedu.eu/sk> - for the Slovak Republic (Slovak)
- <https://database.craftedu.eu/at> - for Austria (German)
- <https://database.craftedu.eu/bg> - for Bulgaria (Bulgarian)

Figure 18 – Login/Introduction screen (for the Czech variant)



Figure 19 – Menu of introduction screen (for the Czech variant)



**Point 1 – access to the database of training courses.** The applicant can view the accessible courses here and to choose the most suitable courses for his/her professional qualification. To enter the course and to obtain study materials, the registration is required.

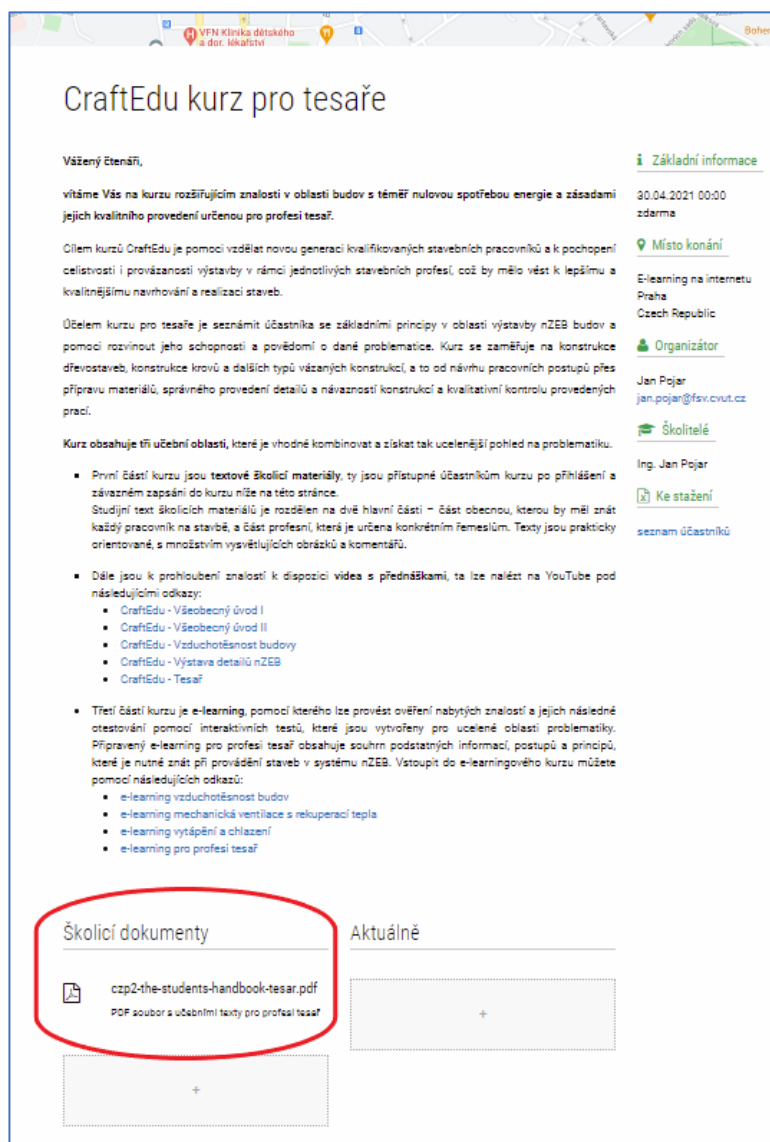
**Point 2 – under this link, the interested party will find a form for registration in the CraftEdu database.** After completing and submitting the form, you can sign up for the selected courses.

#### 4.5.2 Step 2: Procedure for obtaining study material

After logging in, the course participant will get an access to downloading the created study materials (PDF format). These training materials are available on the page of individual course in the block "training documents"

After clicking on the link, the course participant will be allowed to download pdf materials. The "Student's handbook" prepared within the CraftEdu project is available to the course participant. There are also "Trainer's guidebook" and "Tests" available for the trainers, which should support them in the teaching process.

Figure 20 – Course page - obtaining training documents (for the Czech variant)



**CraftEdu kurz pro tesaře**

Vážený čtenáři,

vítáme Vás na kurzu rozšiřujícím znalosti v oblasti budov s téměř nulovou spotřebou energie a zásadami jejich kvalitního provedení určenou pro profesi tesař.

Cílem kurzů CraftEdu je pomoci vzdělávat novou generaci kvalifikovaných stavebních pracovníků a k pochopení celistvosti i provázanosti výstavby v rámci jednotlivých stavebních profesí, což by mělo vést k lepšímu a kvalitnějšímu navrhování a realizaci staveb.


Účelem kurzu pro tesaře je seznámit účastníka se základními principy v oblasti výstavby nZEB budov a pomoci rozvinout jeho schopnosti a povědomí o dané problematice. Kurz se zaměřuje na konstrukce dřevostavěb, konstrukce krovů a dalších typů vázaných konstrukcí, a to od návrhu pracovních postupů přes přípravu materiálů, správného provedení detailů a návaznosti konstrukcí a kvalitativní kontrolu provedených prací.

Kurz obsahuje tři učební oblasti, které je vhodné kombinovat a získat tak ucelenější pohled na problematiku.

- První částí kurzu jsou textové školící materiály, ty jsou přístupné účastníkům kurzu po přihlášení a závazným zapsání do kurzu níže na této stránce. Studijní text školících materiálů je rozdělen na dvě hlavní části – část obecnou, kterou by měl znát každý pracovník na stavbě, a část profesní, která je určena konkrétním řemeslům. Texty jsou prakticky orientované, s množstvím vysvětlujících obrázků a komentářů.
- Dále jsou k prohloubení znalostí k dispozici videa s přednáškami, ta lze nalézt na YouTube pod následujícími odkazy:
  - CraftEdu - Všeobecný úvod I
  - CraftEdu - Všeobecný úvod II
  - CraftEdu - Vzduchotěsnost budovy
  - CraftEdu - Výstavba detailů nZEB
  - CraftEdu - Tesař
- Třetí částí kurzu je e-learning, pomocí kterého lze provést ověření nabytých znalostí a jejich následné otestování pomocí interaktivních testů, které jsou vytvořeny pro ucelené oblasti problematiky. Připravený e-learning pro profesi tesař obsahuje souhrn podstatných informací, postupů a principů, které je nutné znát při provádění staveb v systému nZEB. Vstupit do e-learningového kurzu můžete pomocí následujících odkazů:
  - e-learning vzduchotěsnost budov
  - e-learning mechanická ventilace s rekuperací tepla
  - e-learning vytápění a chlazení
  - e-learning pro profesi tesař

**Školící dokumenty**

Aktuálně

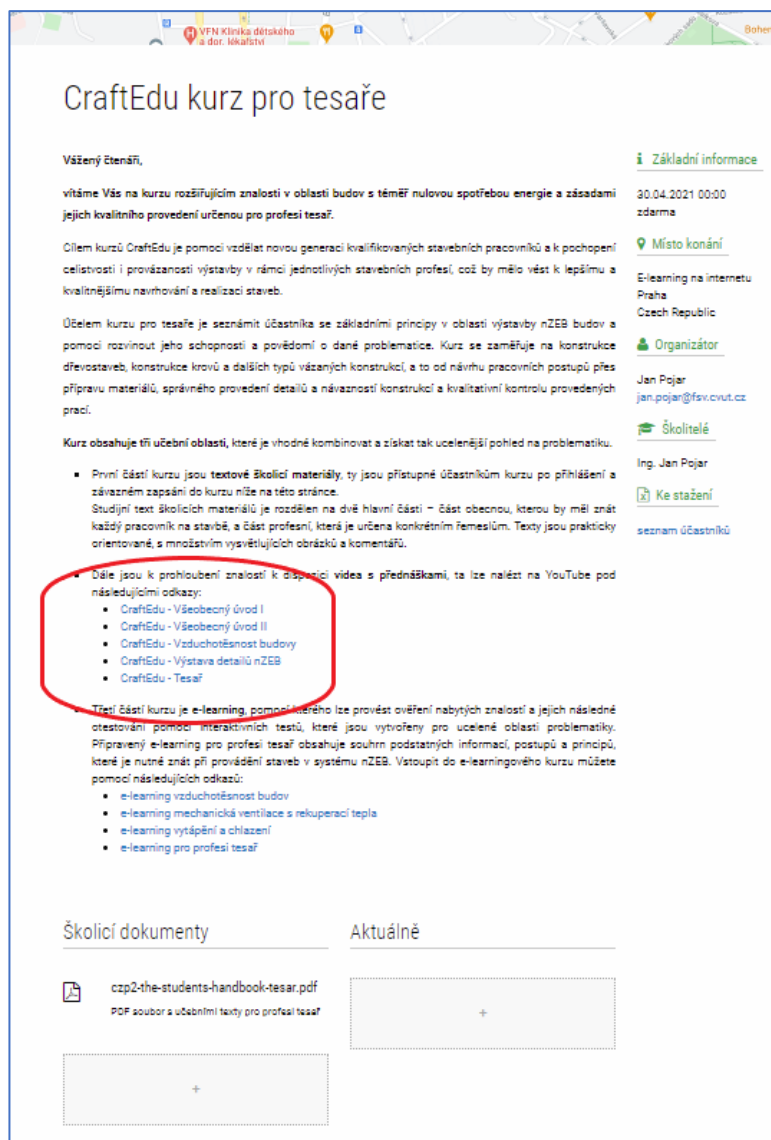
 czp2-the-students-handbook-tesar.pdf  
PDF soubor s učebními texty pro profesi tesař

+

#### 4.5.3 Step 3: Procedure for obtaining video material

After registering, the course participant will have an access to the links to the created videos with lectures and to video courses. These training materials are available on YouTube with an access to individual videos for each course. Each course refers to the videos that are relevant to the appropriate profession.

Figure 21 – Course page - obtaining link for video material (for the Czech variant)



**CraftEdu kurz pro tesaře**

Vážený čtenáři,

vítáme Vás na kurzu rozšiřujícím znalosti v oblasti budov s tématem nulovou spotřebou energie a zásadami jejich kvalitního provedení určenou pro profesi tesař.

Cílem kurzu CraftEdu je pomoci vzdělat novou generaci kvalifikovaných stavebních pracovníků a k pochopení celistvosti i provázanosti výstavby v rámci jednotlivých stavebních profesí, což by mělo vést k lepšímu a kvalitnějšímu navrhování a realizaci staveb.

Účelem kurzu pro tesaře je seznámit účastníka se základními principy v oblasti výstavby nZEB budov a pomoci rozvinout jeho schopnosti a povědomí o dané problematice. Kurz se zaměřuje na konstrukce dřevostavěb, konstrukce krovů a dalších typů vázaných konstrukcí, a to od návrhu pracovních postupů přes přípravu materiálů, správného provedení detailů a návazností konstrukcí a kvalitativní kontrolu provedených prací.

Kurz obsahuje tři učební oblasti, které je vhodné kombinovat a získat tak ucelenější pohled na problematiku.

- První částí kurzu jsou textové školicí materiály, ty jsou přístupné účastníkům kurzu po přihlášení a závazněm zapsání do kurzu níže na této stránce. Studijní text školicích materiálů je rozdělen na dvě hlavní části – část obecnou, kterou by měl znát každý pracovník na stavbě, a část profesní, která je určena konkrétním řemeslům. Texty jsou prakticky orientované, s množstvím vysvětlujících obrázků a komentářů.
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  - CraftEdu - Všeobecný úvod II
  - CraftEdu - Vzduchotěsnost budovy
  - CraftEdu - Výstavba detailů nZEB
  - CraftEdu - Tesař
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  - e-learning vzduchotěsnost budov
  - e-learning mechanická ventilace s rekuperací tepla
  - e-learning vytápění a chlazení
  - e-learning pro profesi tesař

**Školicí dokumenty**

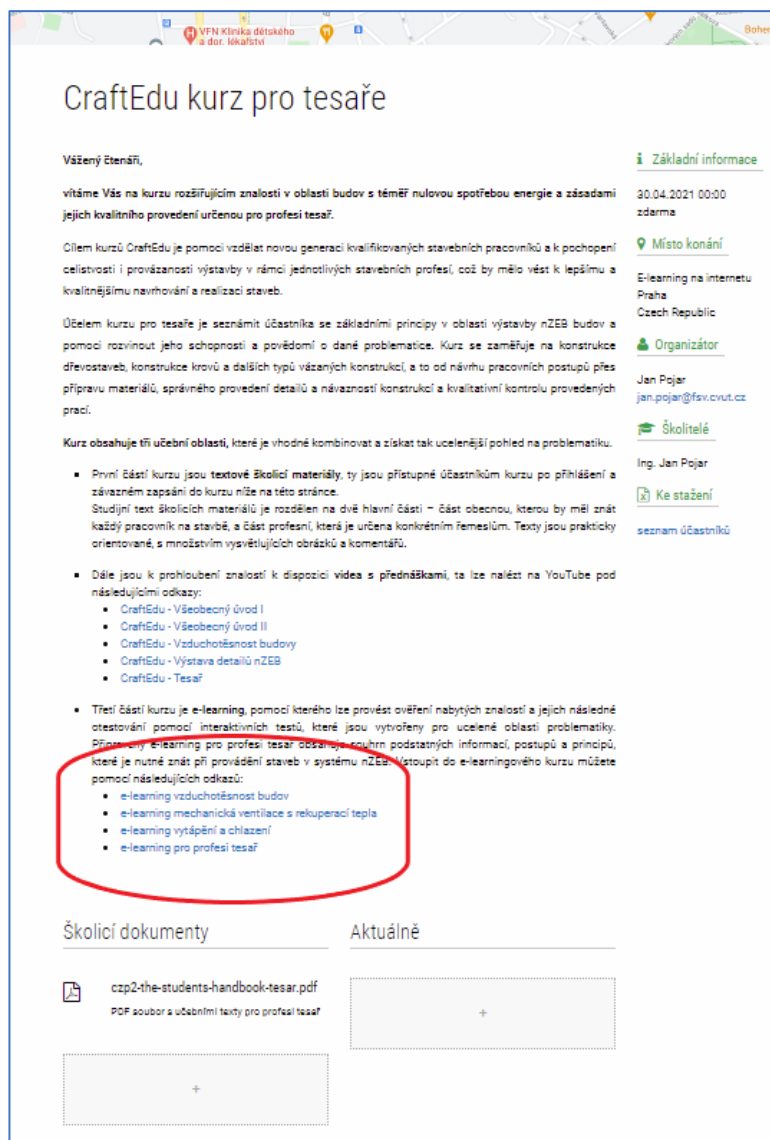
czp2-the-students-handbook-tesar.pdf  
PDF soubor s učebními texty pro profesi tesař

**Aktuálně**

#### 4.5.4 Step 4: E-learning - registration and e-learning completion process

After registering for the course, the course participant has the opportunity to use the e-learning material. E-learning courses offer the possibility of verifying the acquired knowledge by studying the "student's handbook". Here, the course participant can check his knowledge and repeat the most important parts of the training.

Figure 22 – Course page – e-learning link (for the Czech variant)



**CraftEdu kurz pro tesaře**

Vážený čtenáři,

vítáme Vás na kurzu rozšiřujícím znalosti v oblasti budov s téměř nulovou spotřebou energie a zásadami jejich kvalitního provedení určenou pro profesi tesař.

Cílem kurzů CraftEdu je pomoci vzdělávat novou generaci kvalifikovaných stavebních pracovníků a k pochopení celistvosti i provázanosti výstavby v rámci jednotlivých stavebních profesí, což by mělo vést k lepšímu a kvalitnějšímu navrhování a realizaci staveb.

Účelem kurzu pro tesaře je seznámit účastníka se základními principy v oblasti výstavby nZEB budov a pomoci rozvinout jeho schopnosti a povědomí o dané problematice. Kurz se zaměřuje na konstrukce dřevostaveb, konstrukce krovů a dalších typů vázaných konstrukcí, a to od návrhu pracovních postupů přes přípravu materiálů, správného provedení detailů a návazností konstrukcí a kvalitativní kontrolu provedených prací.

Kurz obsahuje tři učební oblasti, které je vhodné kombinovat a získat tak ucelenější pohled na problematiku.

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  - CraftEdu - Vzduchotěsnost budovy
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  - e-learning vzduchotěsnost budov
  - e-learning mechanická ventilace s rekuperací tepla
  - e-learning vytápění a chlazení
  - e-learning pro profesi tesař

**Školící dokumenty**

**Aktuálně**

czp2-the-students-handbook-tesar.pdf  
PDF soubor s učebními texty pro profesi tesař

Several common courses are available for each profession. These courses deal with the general introduction to the issue of nZEB, airtightness of buildings and acquaint the participant with the detailed models of the structures.

Each profession also has its own e-learning content.

#### Introduction to the e-learning content

When the user uses the e-learning link, he gets to the e-learning web application. The first page contains a description of the e-learning course, there is important information about the course and a brief content.

Below the course description, there is a button to enter the course.

Figure 23 – E-learning course introduction page – Airtightness (for the Czech variant)



### Course progress bar

Each course has its own progress bar. The progress bar shows the number of pages in the course, the current position in the course (page displayed), and the number of pages already completed.

- Blue Cells - Already read pages and answered quizzes;
- Green cell - Currently displayed page;
- Grey cells – Unexplored pages.

Figure 24 – E-learning course – Course progress bar



The progress bar can also be used as a button to return to the already displayed pages of the e-learning course.


### Pages of e-learning course

Study topics for the selected profession are divided into chapters and displayed on the pages of the e-learning course based on technological and technical focus. The content of the page consists of text, tables and pictures.

Figure 25 – E-learning course – forms of the e-learning course pages (for the Czech variant)

## Úvod do problematiky

Budovami s téměř nulovou spotřebou energie se myslí budovy s nízkou energetickou náročností, potažmo s pokrytím části energie z obnovitelných zdrojů. Blíží požadavky na nZEB jsou definovány v zákoně č. 406/2000 Sb., o hospodáření energií a zejména v jeho prováděcím předpisu, ve vyhlášce č. 78/2013 Sb. o energetické náročnosti budov (respektive v nové vyhlášce č. 264/2020 Sb. o energetické náročnosti z června 2020, která vstoupí v účinnost 1. září 2020). Aby standard nZEB bylo dosaženo, je proto potřeba jak během návrhu stavby, tak během její realizace, dodržet určitá pravidla a principy.




U těchto témat je vhodné, aby je znali všichni pracovníci, kteří se budou na výstavbě budovy podílet, protože každý pracovník může zapříčinit nebo naopak chybu, která by mohla v budoucnu způsobit problémy a mít negativní dopad na kvalitu bydlení i na náklady na odstranění takové chyby.

[Další lekce](#)

## Vzduchotěsnost 1 - Úvod do vzduchotěsnosti

Vzduchotěsnost neboli také neprůvzdušnost, představuje schopnost prvku propouštět vzduch.



**Popis:**

1. Odtok dopadající vody,
2. Ochrana proti větru,
3. Izolační a vzduchotěsná vrstva,
4. Vrstva pro kontrolu páry,
5. Ochrana proti přehřátí

**Vliv vzduchotěsnosti na budovu**


- 1) Zabraňuje možnosti vzniku kondenzace uvnitř konstrukce (zabraňuje poškození a snížení životnosti konstrukce) - netěsnostmi může proudit z interiéru do exteriéru teplý vzduch hnaný výtlačkem vzduchu nebo provozem vzduchotechnického zařízení a působit tak jako nositel vlhkosti
- 2) Zabraňuje tepelným ztrátám (úspora energie prostřednictvím snížené infiltrace/exfiltrace) - nekalitně provedené a netěsné konstrukce lze srovnat s podvedeným oknem, kudy se v zimě teplo ztrácí ve velkém množství.
- 3) Zvyšuje ochranu proti hluku - zvukové vlny se snadno šíří vzduchem, např. přes případné mezery či neutěsněné prostory, jejich utěsněním se zvyšují zvukové izolační vlastnosti konstrukce
- 4) Zvyšuje kvalitu vzduchu - umožňuje lepší cirkulaci a efektivnější využití regulované výměny vzduchu
- 5) Zabraňuje vnikání znečišťujících látek do místnosti
- 6) Zvyšuje komfort bydlení - napomáhá udržení stability nastaveného vnitřního prostředí, dále zamezuje např. suchu nebo akumulaci studeného vzduchu v přízemí

[Další lekce](#)

## Vytápění a chlazení 2 - Různé typy budov a technologií

Jednotlivé typy budov a technologií mají vzhledem ke svým fyzikálním vlastnostem různou schopnost absorbovat teplo. Od toho se odvíjí rychlost, s jakou je možné vytopit stavbu. Schopnost absorpce tepla má zároveň vliv i na dobu, po kterou si konstrukce teplo dokáže udržet, což může mít vliv například na stabilitu teplot v noci (přes den se místnosti vytopí a přes část noci si díky konstrukčním údržbám stabilní teplotu).

Zděné a betonové konstrukce lépe akumulují teplo. Dřevěné konstrukce a interiérová izolace mají špatné akumulaci vlastnosti, ale dochází tak k okamžité změně teploty při potřebě ochladit nebo vytopit místnost apod.



**Zleva:**

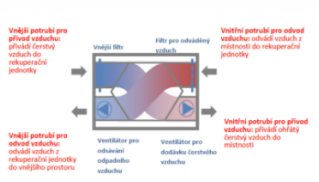
- Zděná konstrukce + ETHICS, Izolační cihly
- Železobeton + tepelná izolace
- Systém ocelových rámu + tepelná izolace
- Izolační betonové bednění
- Dřevěná (dřevěný rám, CLT, TJI/FJI, ...) + tepelná izolace

[Další lekce](#)

## Mechanická ventilace s rekuperací tepla 2 - Jednotka mechanické ventilace s rekuperací tepla

**Jednotka mechanické ventilace s rekuperací tepla**

Celý systém mechanické ventilace je řízen jednotkou mechanické ventilace, dnes se již standardně používají jednotky s rekuperací tepla („Mechanical Ventilation with Heat Recovery“ MVHR). Tato jednotka se stará o veškeré procesy úprav přiváděného a odváděného vzduchu.



Do jednotky MVHR vedou minimálně čtyři základní potrubí, která zajišťují odvod odpadního vzduchu a přívod čerstvého vzduchu do interiéru. Čerstvý vzduch je filtrován a přiváděn do jednotky přivodním potrubím, v jednotce dochází k rekuperaci tepla, čerstvý vzduch se ohřívá/chladí pomocí odpadního vzduchu a může být dále upraven (dofiltrován/chlazen, úprava vlhkosti, ...). Odpadní potrubí naopak odvádí odpadní vzduch, v jednotce se využije pro rekuperaci tepla a je odveden mimo objekt.

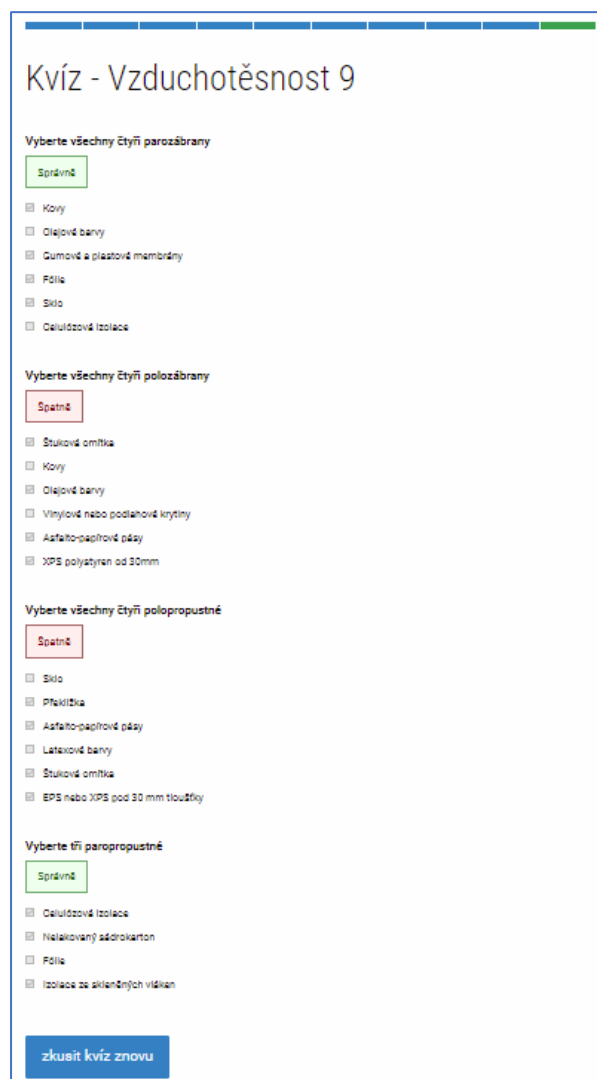
[Další lekce](#)

The user can proceed to the next page by clicking on the button at the bottom of the page, after studying the displayed page. After clicking on the button, the participant of the e-learning course moves to the next page or a quiz corresponding to the lesson just completed.



## Quiz questions and knowledge verification

Figure 26 Selected page of e-learning - one of the Quizzes (Czech variant)



**Kvíz - Vzduchotěsnost 9**

**Vyberte všechny čtyři parozábrany**

☒ Správně

- ☐ Kovy
- ☐ Olejové bany
- ☐ Gumové a plastové membrány
- ☐ Fólie
- ☐ Sklo
- ☐ Celulózní izolace

**Vyberte všechny čtyři polozábrany**

☐ Spatně

- ☐ Štuková omítka
- ☐ Kovy
- ☐ Olejové bany
- ☐ Vinylové nebo podlahové krytiny
- ☐ Asfalto-papírové pásy
- ☐ XPS polystyren od 30mm

**Vyberte všechny čtyři polopropustné**

☐ Spatně

- ☐ Sklo
- ☐ Písečnice
- ☐ Asfalto-papírové pásy
- ☐ Latexové bany
- ☐ Štuková omítka
- ☐ EPS nebo XPS pod 30 mm tloušťky

**Vyberte tři paropropustné**

☒ Správně

- ☐ Celulózní izolace
- ☐ Neleakovaný sádrokarton
- ☐ Fólie
- ☐ Izolace ze skleněných vláken

**zkoušet kvíz znovu**

The course participant in the context of e-learning can test the acquired knowledge through quizzes. The quiz is part of the e-learning courses.

The quiz evaluates the answers of the user, and shows, which questions were answered incorrectly (red color). The participant obtains the information, what he/she must add to successfully complete the course.

Quizzes are always positioned after the closing of the thematic area. They help the participant to understand the most important information received.

### Form of the quiz questions

Quiz questions have various forms. They can look like a simple question with one correct answer or a question with more than one correct answer, where user must mark them all.

Furthermore, the questions may look like a blind table, where the user must correctly assign the answers to the correct columns and rows.

Last but not the least, there are very interesting questions for compiling the right order. These formats are mainly used for the questions related to technological processes.

## 5 Conclusion and next steps

After researching the available software for creating online courses, creating a registration system for the education and distributing the study materials, it was decided to create its own database for the CraftEdu project (<https://database.craftedu.eu>). The database has been created, that allows administrators to manage online and offline courses and to create e-learning content.

The prepared documents in the previous phases of the project are interconnected. "Student's handbook" documents and links to the created video lectures, as well as e-learning courses are made available to the course participants.

The environment of the front end was further improved to be maximally user friendly. This process was running till the end of the project, specifically the input data of the participant, cloning the courses and other optimisations.

**Table of currently available courses in the CraftEdu database:**

Czech courses	
CraftEdu course for HVAC installers "CraftEdu kurz pro montéra vzduchotechniky HVAC"	<a href="https://database.craftedu.eu/cs/course/13">https://database.craftedu.eu/cs/course/13</a>
CraftEdu course for carpenters "CraftEdu kurz pro tesaře"	<a href="https://database.craftedu.eu/cs/course/9">https://database.craftedu.eu/cs/course/9</a>
CraftEdu course for installer of window systems "CraftEdu kurz pro montéra okenních výplní"	<a href="https://database.craftedu.eu/cs/course/14">https://database.craftedu.eu/cs/course/14</a>
CraftEdu course for electricians (low voltage) "CraftEdu kurz pro elektrikáře (slaboproud)"	<a href="https://database.craftedu.eu/cs/course/18">https://database.craftedu.eu/cs/course/18</a>
CraftEdu course for electricians (hight voltage) "CraftEdu kurz pro elektrikáře (silnoproud)"	<a href="https://database.craftedu.eu/cs/course/19">https://database.craftedu.eu/cs/course/19</a>
CraftEdu course for hydro-insulators "CraftEdu kurz pro montéra hydroizolací spodní stavby"	<a href="https://database.craftedu.eu/cs/course/15">https://database.craftedu.eu/cs/course/15</a>
CraftEdu course for chimney sweeps - builder "CraftEdu kurz pro kominíka - montáž komínů a komínových vložek"	<a href="https://database.craftedu.eu/cs/course/16">https://database.craftedu.eu/cs/course/16</a>
CraftEdu course for chimney sweeps - inspecting "CraftEdu kurz pro kominíka - revizní technik spalinových cest"	<a href="https://database.craftedu.eu/cs/course/17">https://database.craftedu.eu/cs/course/17</a>
Slovak courses	
CraftEdu course for installer of window systems "CraftEdu kurz pre montážnika okien"	<a href="https://database.craftedu.eu/cs/course/24">https://database.craftedu.eu/cs/course/24</a>
Course for the profession of electrician for intelligent wiring "Kurz pre profesiu Elektrikár pre inteligentnú elektroinštaláciu"	<a href="https://database.craftedu.eu/cs/course/22">https://database.craftedu.eu/cs/course/22</a>
CraftEdu course for electricians (hight voltage) "Kurz pre profesiu Elektrikár silnoprúd"	<a href="https://database.craftedu.eu/cs/course/23">https://database.craftedu.eu/cs/course/23</a>
CraftEdu course for carpenters "CraftEdu kurz pre tesárov"	<a href="https://database.craftedu.eu/cs/course/20">https://database.craftedu.eu/cs/course/20</a>
CraftEdu course for hydro-insulators "CraftEdu kurz pre hydroizolátéra (Hydrizolácia plochých striech)"	<a href="https://database.craftedu.eu/cs/course/25">https://database.craftedu.eu/cs/course/25</a>

Bulgarian courses	
CraftEdu course for hydro-insulators "CraftEdu курс за монтажник на хидроизолации в строителството"	<a href="https://database.craftedu.eu/cs/course/30">https://database.craftedu.eu/cs/course/30</a>
CraftEdu course for installer of window systems "CraftEdu курс за монтажник на прозоречни системи"	<a href="https://database.craftedu.eu/cs/course/29">https://database.craftedu.eu/cs/course/29</a>
CraftEdu course for HVAC installer "CraftEdu курс за монтажник на ОВК инсталации"	<a href="https://database.craftedu.eu/cs/course/33">https://database.craftedu.eu/cs/course/33</a>
Construction specialist for almost zero-energy buildings "Строителен специалист за почти нулево-енергийни сгради"	<a href="https://database.craftedu.eu/cs/course/37">https://database.craftedu.eu/cs/course/37</a>
Basic principles of the near-zero energy building "Основни принципи на почти нулево-енергийната сграда (ПНЕС)"	<a href="https://database.craftedu.eu/cs/course/36">https://database.craftedu.eu/cs/course/36</a>
Austrian courses	
CraftEdu course for flatroofer (hydroinsulators) "Flachdachbau und Bauwerksabdichtung"	<a href="https://database.craftedu.eu/at/course/27">https://database.craftedu.eu/at/course/27</a>
CraftEdu course for installers of windows "Anforderungen an Fenstersysteme"	<a href="https://database.craftedu.eu/at/course/28">https://database.craftedu.eu/at/course/28</a>
CraftEdu course safety at work "Arbeitsschutz und Arbeitssicherheit"	<a href="https://database.craftedu.eu/at/course/40">https://database.craftedu.eu/at/course/40</a>
CraftEdu course for carpenters Thermal bridges "Wärmebrücken"	<a href="https://database.craftedu.eu/at/course/41">https://database.craftedu.eu/at/course/41</a>
CraftEdu course passive house "Einführung Passivhaus"	<a href="https://database.craftedu.eu/at/course/42">https://database.craftedu.eu/at/course/42</a>

As part of the project, e-learning content was created in the database. E-learning courses are divided into two parts. The first part focuses on common theoretical issues (airtightness, cooling and heating, mechanical ventilation, etc.) The second part is prepared individually for each profession and focuses on the use of materials and proper technological procedures within the profession.

List of currently available e-learning courses in the CraftEdu database:

### Czech e-learning courses

- nZEB part 1: Airtightness of buildings – "nZEB část 1: Vzduchotěsnost budov"
- nZEB part 2: Mechanical ventilation with heat recovery – "nZEB část 2: Mechanická ventilace s rekuperací tepla"
- nZEB part 3: Heating and cooling – "nZEB část 3: Vytápění a chlazení"
- Refrigerants – "Chladiva"
- CZP1 HVAC installer – "CZP1 montér vzduchotechniky HVAC"
- CZP2 Carpenter – "CZP2 Tesař"
- CZP3\_P6 Electrician – "low voltage/high voltage) (CZP3\_P6 Elektrikář (Slaboproud) / Elektrikář (Silnoproud))"
- CZP4 Installer of window systems – "CZP4 Montér okenních výplní"
- CZP5 Hydro-insulator – "CZP5 Montér hydroizolací spodní stavby"

- CZP7\_P8 Stove and chimney builder/Inspecting – *“CZP7\_P8 Kominík-montážník komínů a komínových vložek, Kominík-revizní technik”*

### Slovak e-learning courses

- SKP2 Carpenter – *“SKP2 Tesár”*
- SKP3 Electrician (50V – 1000V) – *“SKP3 Elektrikár pre silnoprúd”*
- SKP4 Installer of window systems – *“SKP4 Montáž otvorových výplní – okien”*
- SKP5 Hydro-insulator – *“SKP5 Hydroizolácia plochých striech”*
- SKP6 Electrician for smart electro-instalations – *“SKP6 Elektrikár pre inteligentnú elektroinštaláciu”*
- nZEB part 1: Airtightness of buildings – *“nZEB časť 1: Vzduchotesnosť budov”*
- nZEB part 2: Mechanical ventilation with heat recovery – *“nZEB časť 2: Mechanická ventilácia s rekuperáciou tepla”*
- nZEB part 3: Heating and cooling – *“nZEB časť 3: Vytápění a chlazení”*

### Bulgarian e-learning courses

- nZEB Part 1: Building envelope – *“ПНЕС Част 1: Сградна обвивка”*
- nZEB Part 2: Efficient thermal insulation – *“ПНЕС Част 2: Ефективна топлоизолация”*
- nZEB Part 3: Efficient windows and doors – *“ПНЕС Част 3: Ефективни прозорци и врати”*
- nZEB Part 4: Thermal bridges – *“ПНЕС Част 4: Топлинни мостове”*
- nZEB Part 5: Airtightness – *“ПНЕС Част 5: Въздухоплътност”*
- nZEB Part 6: Mechanical ventilation with heat recovery – *“ПНЕС Част 6: Механична вентилация с рекуперация”*
- nZEB Part 7: Heat losses and gains in buildings – *“ПНЕС Част 7: Топлинни загуби и печалби в сградите”*
- nZEB Part 8: Economic efficiency – *“ПНЕС Част 8: Икономическа ефективност”*
- nZEB Part 9: Design and Construction – *“ПНЕС Част 9: Проектиране и строителство”*
- CraftEdu HVAC Installer Course – *“CraftEdu Курс за монтажник на ОВК инсталации”*
- CraftEdu Window Installer Course – *“CraftEdu Курс за монтажник на прозоречни конструкции”*
- CraftEdu Construction Waterproofing Installer Course – *“CraftEdu Курс за монтажник на хидроизолации в строителството”*

### Austrian e-learning courses

- Requirements for window systems – *“Anforderungen an Fenstersysteme”*
- Flat roof construction and building waterproofing – *“Flachdachbau und Bauwerksabdichtung”*



- Airtightness of buildings – *“Luftdichtheit von Gebäuden”*

#### Summary of developed project results:

The following training courses and teaching materials were developed and launched within the CraftEdu project. The following summary gives the total learning materials, courses divided for each country:

#### **Czech Republic**

- 8 online training courses
- more than 640 pages of training texts for a total of 8 professions
- 16 video courses and lectures
- 10 e-learning courses

#### **Slovakia**

- 5 online training courses
- 8 e-learning courses
- 537 pages of training texts for 5 professions
- 37 video courses and lectures (881 minutes)

#### **Austria**

- 5 online training courses
- 3 e-learning courses

#### **Bulgaria**

- 5 online training courses
- 12 e-learning courses

## 6 References

- [1] Lee, T., & Lee, J.: Quality assurance of web based e-learning for statistical education (2006). COMPSTAT: Proceedings in Computational Statistics: 17th Symposium, Rome.
- [2] Marquès, P.: Definición del e-learning (2006). Retrieved from [www.pangea.org/peremar-ques](http://www.pangea.org/peremar-ques).
- [3] Bermejo, S.: Cooperative electronic learning in virtual laboratories through forums (2005). IEEE Transactions on Education, 48(1), 140-149.
- [4] Sangra, A., Vlachopoulos, D., Cabrera, N.: Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework (2012). IRRODL, Vol. 13(2) ISSN 1492-3831.
- [5] Kats, Y.: Learning Management Systems and Instructional Design – Best Practices in Online Education (2013). Information Science Reference. ISBN: 978-1-4666-3930-0.

### 6.1 Used online resources

- <https://elearningindustry.com/directory/elearning-software/>
- [https://docs.moodle.org/36/en/About Moodle](https://docs.moodle.org/36/en/About_Moodle)
- <https://moodle.com/about/>
- <https://moodle.com/pricing/>
- <https://elearningindustry.com/directory/elearning-software/moodle/reviews>
- <https://blog.geen.io/courselle-a-story-of-the-new-name-for-geenio-lms-9533feb7d641>
- <https://elearningindustry.com/directory/elearning-software/geenio-lms>
- <https://courselle.com/>
- <https://www.canvaslms.com/about-us/>
- <https://www.canvaslms.com/k-12/>
- <https://www.canvaslms.com/try-canvas>
- <https://elearningindustry.com/directory/elearning-software/canvas>
- <https://www.epignosishq.com/>
- <https://www.talentlms.com/prices>
- <https://elearningindustry.com/directory/elearning-software/talentlms>
- <https://www.schoology.com/about>
- <https://elearningindustry.com/directory/elearning-software/schoology>
- <https://www.betterbuys.com/lms/reviews/schoology-lms/>
- [http://services.google.com/fh/files/misc/google\\_edu\\_g\\_suite\\_for\\_education.pdf](http://services.google.com/fh/files/misc/google_edu_g_suite_for_education.pdf)
- <https://reviews.financesonline.com/p/google-classroom/>
- <https://www.litmos.com/litmos-pricing>
- <https://www.docebo.com/about-docebo-learning-platform/>



A. Deliverable details	
<b>Document Reference #:</b>	D2.7
<b>Title:</b>	Developed e-learning content for the training programmes in the targeted countries
<b>Version Number:</b>	1.0
<b>Preparation Date:</b>	30/11/2021
<b>Delivery Date:</b>	30/11/2021
<b>Author(s):</b>	Renáta Schneiderová Heralová (CVUT), Jan Pojar (CVUT), Petr Matějka (CVUT), Eduard Hromada (CVUT), Dragomir Tzanev (Eneffect), Jiří Karásek (SEVEn), Ronald Setznagel (17&4), František Doktor (ViaEuropa)
<b>Contributors:</b>	
<b>Work Package:</b>	WP2
<b>Type of deliverable:</b>	Report
<b>Format:</b>	PDF
<b>Dissemination Level:</b>	Public

## CraftEdu project partners:



## Annex 1

### Table of comparison of LMSs

Category		Moodle	Courselle	Canvas	TalentLMS	Schoology	Google Classroom	Litmos	Docebo	iSpring Learn	Blackboard	Chamilo	Asentia	Thought Industries
General	Web	<a href="https://moodle.org/">https://moodle.org/</a>	<a href="https://courselle.com/">https://courselle.com/</a>	<a href="https://www.canvaslms.com/">https://www.canvaslms.com/</a>	<a href="https://www.talentlms.com/">https://www.talentlms.com/</a>	<a href="https://www.schoology.com/">https://www.schoology.com/</a>	<a href="https://classroom.google.com/">https://classroom.google.com/</a>	<a href="https://www.litmos.com/">https://www.litmos.com/</a>	<a href="https://www.docebo.com/">https://www.docebo.com/</a>	<a href="https://www.ispringolutions.com/ispring-learn">https://www.ispringolutions.com/ispring-learn</a>	<a href="https://www.blackboard.com/">https://www.blackboard.com/</a>	<a href="https://chamilo.org/en/">https://chamilo.org/en/</a>	<a href="https://www.asentialms.com/">https://www.asentialms.com/</a>	<a href="https://www.thoughtindustries.com/">https://www.thoughtindustries.com/</a>
	Country	United States	Cyprus	United States	Greece	United States	United States	Ireland	Canada	United States	United States	Spain	United States	United States
	Comment		Used to be called Geenio									Originated in Belgium		
	Platforms	Linux, Mac, Windows	Linux, Mac, Windows	Linux, Mac, Windows	Linux, Mac, Windows	Mac, Windows	Linux, Mac, Windows			Linux, Mac, Windows	Linux, Mac, Windows	Linux, Mac, Windows	Linux, Mac, Windows	Linux, Mac, Windows
Language	English	X	X	X	X	X	X	X	X	X	X	X	X	X
	Czech	X					X					partly		
Learning	Asynchronous self-paced	X	X	X	X			X	X	X	X	X	X	X
	Asynchronous led	X	X		X			X	X	X	X	X	X	X
	Virtual classroom			X	X			X	X		X	X	X	X
	Blended learning	X			X	X	X	X	X	X	X	X	X	X
Features	Roles	X	X	X	X	X		X	X	X		X	X	X
	Permissions	X		X	X	X	X	X	X	X		X	X	X
	Teams	X	X		X	X	X	X	X	X	X		X	X
	Registration	Automated, Semi-automated, Manual	Automated, Semi-automated, Manual, API	Automated	Automated, Semi-automated, Manual, API, No	?	?	Automated, Manual, API, No	Automated, Semi-automated Manual, API	Automated, Semi-automated Manual, API, No	Automated	Automated, Semi-automated Manual, API, No	Automated, Semi-automated Manual, API, No	Automated, Semi-automated Manual, API, No
	Enrollment	Manual, Self, Automated	Guest, Manual, Self	Self, Automated	Guest, Manual, Self, Automated	?	?	Manual, Self, Automated	Manual, Self, Automated	Guest, Manual, Self, Automated	Self	Guest, Manual, Self	Guest, Manual, Self, Automated	Guest, Manual, Self, Automated
	Attendance tracking	X	X	X	X	X		X	X	X	X	X	X	X
	Course authoring	X	X	X	X	X		X	X	Only with iSpring Suite	X	X	X	X
	Course upload	X	X	X	X		X	X	X	X		X	X	X
	Tests	X	X	X	X	X		X	X	X	X	X	X	X
	Surveys	X			X		X	X	X	X		X	X	X
	Assignments	X	X	X	X	X		X	X	X		X	X	X
	Discussions	X	X	X	X	X	X	X	X	X		X	X	X
	Chat		X	X	X		X	X	X	X	X	X	X	X
	Grading	X	X		X	X		X	X	X	X	X	X	X
	Gamification		X	X	X			X	X	X	X	X	X	X
	Certifications		X		X			X	X	X		X	X	X
	Calendar	X		X	X	X	X	X	X	X	X		X	X
	Block IP							X	X	X			X	X
	Anti-spam				X			X	X					X
	Anti-virus		X					X	X					X
	Offline support				X			X	X	X				X