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# Implementation guide for e-learning in medical education at Masaryk University

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## 1. Introduction

### 1.1. Context and purpose of this document

This document is a guide for the implementation of e-learning in medical education at Masaryk University Faculty of Medicine. It takes into account the information systems and applications available and supported at Masaryk University, i.e. mainly a combination of tools in the Masaryk University Information System (IS) and Microsoft 365 applications.

An important counterpart to this guide is the document "*Methodological Manual for Online Teaching in Medical Schools*" (hereafter referred to as the Methodological Manual), which summarises information gathered through a survey of students and lecturers and provides information on good practice in online teaching.

### 1.2. How to read this guide

To maximize the value of this implementation manual, readers should approach it according to their specific needs and goals. The following guidance may be helpful in navigating the document:

- **I first want to know the context and methodological procedures for creating e-learning.**
  - Start with the Methodological manual and continue with this guide
- **I want to learn the information gradually.**
  - Browse the guide from the beginning
- **I want to find out basic information about e-learning applications used for medical education at Masaryk University.**
  - Start with section 3. E-learning tools
- **I want to learn how to implement the different segments of medical education into e-learning.**
  - Start with section 4. Teaching modalities
- **I want advice on how to create an e-learning lesson for medical education.**
  - Start with section 5. Guide to creating a course



## 2. Basics

### 2.1. Basic concepts

**E-learning** is a learning modality that utilises electronic technologies, such as computers, tablets, or smartphones, to deliver learning materials and activities. This approach to learning includes various forms of digital content, such as texts, videos, games, or interactive tools, which are typically available via the internet.

The Methodology Manual (section 1.b) provides detailed information on the categorization of e-learning courses. For the purpose of this implementation guide, it's worth noting that e-learning courses can be broadly divided into three categories:

**Synchronous courses**, in which students participate in online learning and have real-time communication with the teacher.

**Asynchronous courses**, in which students are provided with online content, but there is no real-time communication between the student and the teacher.

**Blended (hybrid) courses**, which combine online and face-to-face instruction.

By understanding the different types of e-learning courses available, educators can more effectively tailor their teaching approach to best meet the needs of their students.

### 2.2. Technical requirements

The technical requirements for e-learning are thoroughly detailed in the Methodological Manual (section 2.c). However, for the sake of completeness, it's worth briefly mentioning the recommended requirements specific to the applications described in this implementation guide.

### 2.3. Hardware

In terms of technical requirements for e-learning, a **computer** - either desktop or laptop - is practically a necessity for teachers and is recommended for students as well. According to the Methodological Manual, most teaching platforms require a minimum of 1GHz CPU and 256 MB RAM. However, up to 8 GB RAM may be necessary for more demanding applications.

In addition to a computer, video conferencing requires a **webcam and microphone** (unless they are already integrated into the case of laptops). Specialized hardware, such as a **graphics tablet**, can be used for sketching and MS Whiteboard applications.

While students can use **tablets and smartphones** for basic work and communication, they are not suitable for conducting online lectures and seminars. Teachers should have access to a computer to ensure the effective delivery of e-learning content.



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## 2.4. Internet connection

**High-speed** internet access is crucial for both teachers and students engaged in e-learning. The video calling (video conferencing) applications described later in this implementation guide typically require a download **speed** of at least 4 Mbps and an upload speed of 2.5 - 3.2 Mbps, though an upload and download speed of around 10 Mbps is optimal. It's important to note that speed requirements increase with the number of participants in the online meeting, and for sharing larger files or streaming videos, an upload speed of 20 - 30 Mbps is recommended.

To ensure seamless connectivity during e-learning sessions, it's also recommended to have a **backup connection** in place. For instance, a hotspot on a mobile phone can serve as a backup in case the primary connection fails or is unavailable. This is especially relevant in teaching hospital environments where connectivity may be limited due to cyber security measures. The Methodological Manual also recommends having a backup connection available for this reason.

## 2.5. Software

The applications described in this implementation guide can be accessed through commonly available web browsers, making them accessible to a wide range of operating systems, including Windows, Linux, macOS, Android, and iOS. As a result, learners can choose the operating system that best suits their needs and preferences.

Additionally, some tools mentioned in this guide are available as standalone apps for different operating systems, including mobile platforms such as Android and iOS. If this is the case for a particular tool, the information will be provided directly within the relevant section.



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## 3. E-learning tools

### 3.1. Masaryk University Information System (IS)

The Masaryk University Information System (IS) offers a wide range of tools for e-learning, with the ability to set up a comprehensive e-learning program. This implementation guide will therefore focus primarily on the IS tools while briefly discussing other applications as well. However, it's important to note that this guide does not replace the documentation available within IS but rather serves as basic guidance for the implementation of e-learning in medical education at Masaryk University.

The IS offers extensive help resources in the form of descriptions and online documentation.

The symbol  indicates the availability of a more detailed description of the application and key terms, while the symbol  serves as a hyperlink to another page, usually a help file.

All chapters of the e-learning help are available at: <https://is.muni.cz/auth/napoveda/elearning>.

If any questions arise, support is available in the form of an e-technician (e-mail: [istech@fi.muni.cz](mailto:istech@fi.muni.cz)), who can also provide methodological and didactic assistance. A list of e-technicians can be found at: <https://is.muni.cz/auth/podpora/etech/>. The role and responsibilities of the e-technician are described in detail at: <https://is.muni.cz/auth/napoveda/elearning/etechnik>.

#### 3.1.1. Teacher's Notebook (Teacher)

**Location:** Basic IS application

**Link:** <https://is.muni.cz/auth/ucitel/>

**IS help:** <https://is.muni.cz/auth/napoveda/ucitel/omezeni>

The "Teacher's Notebook" application serves as a fundamental tool and guide to most of the e-learning resources available in IS. Upon logging into the IS, the "Teacher's Notebook" can be accessed via the "Teacher" link on the home page. Once clicked, a list of subjects for which the user is registered as a teacher will be displayed. Teachers can select a subject either by ticking the box next to the subject code or by clicking the blue arrow link (*vybrat [kód předmětu] →*).

Of note is that all materials are implicitly linked to the selected subject, meaning that all study materials, test questions, answer sheets, and other materials are tied to the subject. However, it is possible to share and copy these materials between courses. A detailed description of the process is available in the Copy and Share Study Materials application, which can be accessed via *Teacher's Notebook / Study Materials / Copy and Share Study Materials*.

#### 3.1.2. E-learning

**Location:** Basic IS application

**Link:** <https://is.muni.cz/auth/elearning/>

The e-learning application offers a set of tools similar to those in the Teacher application but which are not restricted to individual subjects, making e-learning accessible to a broader audience with the same options as for students in formal degree programmes.



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### 3.1.3. File Manager

**Location:** Basic IS application

**IS help:**

<https://is.muni.cz/auth/napoveda/komunikace/spravcesouboru>

<https://is.muni.cz/auth/napoveda/elearning/plagiat>

The File Manager is an interface that is accessible from the “Files” application, other tools such as the “Work with Study Materials” tool or when assigning access rights for interactive syllabi. In the IS, every object created or inserted (e.g., teaching material, set of questions for assessment system, interactive syllabus, etc.) is included in the directory structure of the course as a file. The file manager provides features that allow users to add, copy, delete files and assign access rights to them.

The functions of the file manager are thoroughly described in the corresponding help section. It's noteworthy that access rights can be assigned to directories and files, allowing individual objects to be accessible to appropriate IS users. For instance, a file can be read by students but only inserted and managed by teachers.

### 3.1.4. Discussion Groups

**Location:** Basic IS application

**IS help:**

<https://is.muni.cz/auth/napoveda/komunikace/diskuse>

<https://is.muni.cz/auth/napoveda/elearning/komunikace>

The Discussion Groups application provides a way to communicate with students through Subject Discussion Forums and forums for individual seminar groups. These discussion forums can be accessed through the Discussion app or the Teacher's Notebook. The Discussion app also contains other types of forums such as “Topic” and “Off-topic” (“Plkárný”) for fun and leisure discussions and “Community.”

Detailed information on using the Discussion Groups application can be found in the corresponding help documentation (see above).

### 3.1.5. Calendar

**Location:** Basic IS application

**IS help:** <https://is.muni.cz/auth/help/komunikace/kalendar>

The IS calendar is a tool for tracking events and schedules related to the e-learning process. This application provides different layers for viewing a student's personal schedule, teacher's schedule, rooms, and other relevant events. Additionally, the IS calendar can be synchronised with external calendars such as Google Calendar and Microsoft 365. However, it is important to note that the calendar is automatically populated based on information from other IS applications. For further information on how to use the IS calendar, please refer to the IS help documentation available.



### 3.1.6. Work with study materials (Study materials)

**Location:** Teacher's Notebook

**IS help:** <https://is.muni.cz/auth/napoveda/komunikace/materialy>

The "Work with Study Materials" application enables teachers to upload and manage study materials for students. Clicking on this app opens the "File Manager" interface, where each subject has its own directory (folder) containing all relevant files. All materials created by the different tools of the "Teacher's Notebook" can also be managed from here.

The course directory (folder) is specific to the semester and course, and its location in the IS hierarchical document tree is determined by the following address:

`/el/zkratka fakulty/semestr/kód předmětu/`

For example, the address of the Psychiatry-Lecture course for the General Medicine degree program (code VLPY9X1p) in the Fall 2022 semester will be:

`/el/med/spodzim2022/VLPY9X1p/`

It is recommended to follow the default structure of the subject directory, which includes subdirectories and files. This structure facilitates the organisation and management of study materials.

Address in IS	Visible name	Content
<code>.../</code>		The root of the subject directory. It contains implicitly in particular: <ul style="list-style-type: none"> <li>- interactive curriculum files (<code>qwarp</code> extension)</li> <li>- a link to the Provider (a directory where students can upload their own learning materials).</li> </ul>
<code>.../um/</code>	Learning materials	This is where the learning materials available to students are inserted.
<code>.../odp/</code>	ROPOT (Revision, Opinion Poll and Testing)	It contains all the files relevant to the Answering Machine application: <ul style="list-style-type: none"> <li>Links to answerer description files (<code>qref</code> extension)</li> <li>Subdirectory <code>testbank</code></li> </ul>
<code>.../odp/tb/</code>	testbank	Question sets ( <code>qdefx</code> file extension) Answering machine descriptions ( <code>qdesc</code> extension)
<code>.../ode/</code>	Homework vaults	Contains files of the Homework vaults application



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<a href="#">.../op/</a>	Course-Related Instructions	A directory for the Information about course organization.
<a href="#">.../op/hd/</a>	Mail	Directory with bulk letters for students

### 3.1.7. Homework vaults

**Location:** Teacher's Notebook

**IS help:** <https://is.muni.cz/auth/napoveda/ucitel/odevzdavarny>

The "Homework Vaults" application is located in the "*Teacher's Notebook*" and can be used to create folders for submitting homework. This app can limit the time and the seminar groups for which the submission folders are opened, and the files submitted need not be only text files, but other types of files as well. Uploaded files, by default, include the student's ID number (*UČO* from Czech Univerzitní číslo osoby - University Personal Number), first and last name. The functions of this application are further detailed in the corresponding help

### 3.1.8. Interactive syllabi

**Location:** Teacher's Notebook

**IS help:** <https://is.muni.cz/auth/napoveda/elearning/osnova>

Interactive syllabi are simple guideposts that serve to guide students through the e-learning course. A well-designed interactive syllabus is, therefore, the backbone of an e-learning course. It may contain text, images, various learning materials, links to tests, hand-ins, discussion forums, other IS components, as well as files available outside the IS. The interactive syllabus can be organised into individual chapters, which can be opened to students according to a planned schedule. The interactive syllabus editor itself has features similar to standard text editors. Detailed information about editing the syllabus is available in the help file (see above).

It is worth mentioning a few issues:

Using the interactive syllabi is not mandatory. However, it is clearer for students to have the syllabus of the entire course with course information, all study materials, tests and other course components available in one place.

Materials in the form of external objects (images, videos, etc.) can be inserted into the outline either as a link or by dragging and dropping them from any file manager to the edited outline page. The second option is more convenient because when copying the interactive syllabus (for example, between semesters), all materials inserted in this way are automatically copied.

In addition to the "*Edit*" / "*Normal View*" switch, there are several useful functions in the right-hand "*Operations*" column.

When creating a syllabus, you can check that all referenced syllabus components are available to students. For example, if the rights are correctly assigned. The "Validation" function is used for this purpose.

From the interactive syllabus viewing interface, you can check what percentage of the interactive syllabus has been viewed by individual students. The "Přečtenost" ("Completion") function is used for this purpose.





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**TIP: The texts of the interactive syllabus can also be edited using HTML**

Using HTML, teachers can insert various elements into the interactive syllabus, such as a calendar visualization or multimedia objects. The system also supports the use of HTML tags even without the use of the HTML editor.

Overall, the ability to use HTML within the system's editor provides teachers with greater flexibility in designing and customising course materials.

For example:

`<b>Fat Text</b>`

**Bold text**

`<i>Cursive</i>`

*Italics*

`<br>`

Line breaking

### 3.1.9. Question sets

**Location:** Teacher's Notebook

**IS help:**

<https://is.muni.cz/auth/napoveda/elearning/sady>

[https://is.muni.cz/auth/napoveda/elearning/typy\\_otazek](https://is.muni.cz/auth/napoveda/elearning/typy_otazek)

[https://is.muni.cz/auth/napoveda/elearning/navod\\_odp](https://is.muni.cz/auth/napoveda/elearning/navod_odp)

The "Question Sets" application is the primary component of the Masaryk University Information System's assessment functions, designed to create and organize question sets used to build assessments (ROPOTs) in the "Work with ROPOT" application. By splitting assessment definitions into two separate files - question sets and ROPOTs - questions can be better organised and utilised across various assessments.

For example, a single set of questions can be created for a particular study topic and used to generate a practice test. In the final test, the system can randomly select one question from each topic to create a comprehensive and varied assessment.

Questions can be created using a simple graphical interface or by using special syntax in text files known as source files. The application supports various question types, including but not limited to multiple-choice questions, matching, sorting, answer by number, and free text.

### 3.1.10. Work with ROPOT

**Location:** Teacher's Notebook

**IS help:**

<https://is.muni.cz/auth/napoveda/elearning/popisy>

<https://is.muni.cz/auth/napoveda/elearning/testy>



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The "Work with ROPOT" application is the second component of the Masaryk University Information System's assessment functions, complementing the "Question Sets" application. The primary function of ROPOT is to generate ROPOT descriptions, which are files containing crucial information such as the question sets that the ROPOT will be created from, the number of questions it will include, scoring specifications, pass conditions, and access permissions.

ROPOT descriptions can be edited in the ROPOT overview section by selecting the desired ROPOT. The second function of the application involves reviewing answered ROPOTs, evaluating student performance ("Responses provided" link), assessing question difficulty ("Difficulty level" link), and more. This functionality allows for the cultivation of question sets by determining which questions are too easy or challenging.

The creation of ROPOT definitions and the assessment of answered ROPOTs are thoroughly documented in the corresponding help section available in the IS. It's worth noting that ROPOTs can be made available to different students or groups at varying times, and their answers are stored in the results of one ROPOT, eliminating the need for separate answer sheets for each seminar group.

Finally, it's important to mention that while the application offers the ability to create printed tests from ROPOTs, this functionality is beyond the scope of this implementation guide, which focuses on e-learning.

### 3.1.11. Kvis

**Location:** Záznamník učitele

**IS help:** <https://is.muni.cz/auth/napoveda/elearning/kvis>

QuIS is an application that enables the creation of interactive quizzes to be used during e-learning lessons. It offers features and functionality similar to other popular quiz applications such as Mentimeter, Slido, and Quizizz.

### 3.1.12. E-learning from the Student's Point of View

**Location:** Teacher's Notebook

**IS help:** <https://is.muni.cz/auth/napoveda/elearning/identita>

"E-learning from the Student's Perspective" is an application that allows a temporary virtual switch to a selected student's login identity so the system behaves as if the selected student is accessing the course. This feature enables teachers to verify that all e-learning lesson components are accessible and displayed correctly for students. While this allows some of the necessary applications and tools for debugging e-learning lessons to be accessed, it does not allow access to a student's private information, such as mail. Additionally, it is not possible to officially reply on behalf of students in answer sheets. The corresponding help file provides further information on which applications can be checked in this way.

### 3.1.13. Online Lessons

**Location:** Teacher's Notebook

**IS help:** [https://is.muni.cz/auth/napoveda/ucitel/online\\_vyuka](https://is.muni.cz/auth/napoveda/ucitel/online_vyuka)

This application is used to schedule online meetings in Microsoft Teams or another external application. In the case of Microsoft Teams, meetings are scheduled outside the created teams. Scheduled online meetings are visible to students in the "Student" application and are also inserted into the calendar.



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### 3.1.14. Create a Team in Microsoft Teams

**Location:** Záznamník učitele

**IS help:** [https://is.muni.cz/auth/napoveda/ucitel/online\\_vyuka](https://is.muni.cz/auth/napoveda/ucitel/online_vyuka)

This application allows to create and populate a user team in Microsoft Teams directly from the IS. It is possible to create both teams for whole courses and teams for individual seminar groups. However, the teams created in this way are only valid for the current semester and are automatically deleted after the semester ends. This can be disadvantageous when integrating team approaches across Microsoft 365 applications. For example, if a video channel is created in Microsoft Stream that is accessible to a team created by the "Create a Team in Microsoft Teams" application, the accesses need to be updated every semester. Similarly, any references to that team in other applications must be updated.

### 3.1.15. Edit Exam Dates

**Location:** Záznamník učitele

**IS help:** <https://is.muni.cz/auth/napoveda/ucitel/zkousky>

Student assessment is an integral part of teaching. The "Edit Exam Dates" application is used to create and edit exam dates. From the point of view of e-learning, it is worth mentioning its integration with the "ROPOT" application, where the ROPOT can be made available to students registered for the exam term.

### 3.1.16. Evaluation

**Location:** Záznamník učitele

**IS help:** <https://is.muni.cz/auth/napoveda/ucitel/hodnoceni>

This application is mentioned for completeness. It is used to assign grades to individual students and is usually the last application that the instructor will use for a given student. Its detailed description is again available in the corresponding help in the IS.

## 3.2. Microsoft 365 applications

Masaryk University provides its employees and students with access to Microsoft 365 (formerly Office 365), which includes a suite of useful applications for e-learning. This package is available in a multilicense format. The following is a brief overview of some of the tools in this package that are relevant to e-learning. For detailed instructions on their use, please refer to the help section in the individual applications or visit the MU website:

<https://it.muni.cz/sluzby/microsoft-office-365>

Many of these tools are available both through a web browser and as standalone applications. Login credentials for MU employees and students are similar to those for IS. The username includes the user's UČO followed by @muni.cz. The password is the same as the primary password for IS.

<b>Login:</b>	[UČO]@muni.cz	[UČO] is University personal number
<b>Password</b>	[Primary IS password]	Same as for IS




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To access the web version of the Microsoft 365 package (formerly Office 365), users can go (as of January 2023) to:

<http://office.com>

Upon logging in, users will be taken to their home page.

Frequently used applications are available in the column on the left side of the page. To view more apps, click on the icon  to open the menu. If the desired application is not displayed, users can click on [All applications](#) → to open the full list of available apps.

Several tools in the Microsoft 365 package can also be installed as standalone applications on a user's computer. MS Teams, for example, is one such tool.

### 3.2.1. Teams



**Application icon:**

**MU help documentation:** <https://it.muni.cz/sluzby/microsoft-teams>

**IS help:** [https://is.muni.cz/auth/napoveda/ucitel/online\\_vyuka](https://is.muni.cz/auth/napoveda/ucitel/online_vyuka)

MS Teams is a powerful application that enables communication, sharing of materials, and organisation of access between users. As per the Methodological Manual, it is one of the dominant applications used at universities for this purpose. The application is available both from the web interface and as a stand-alone application for Windows, Linux, and mobile phones.

#### 3.2.1.1. Organization of Accesses

In the MS Teams app, you can create teams, which are groups of users that can be used for group communication, file sharing, and access control. These teams can be integrated into other Microsoft 365 applications. Teams can be used to manage document sharing in office applications (MS Word, MS Excel, MS PowerPoint), file sharing (MS OneDrive, MS Stream), and parent objects of other applications (e.g., channels in MS Stream). Channels can be used for a more detailed division of communication.

MS Teams also contains a number of tools that have similar functionality to some of the IS tools described in other sections, such as the "Assignments" and "Grades" tools.

#### 3.2.1.2. Communication

The main function of MS Teams is communication. You can communicate with other users via text or video calls, either within teams or outside of them.

#### 3.2.1.3. Online classes

Online classes are essentially a specific form of communication. Online meetings can again be organised in teams, channels, or outside their structure. During online meetings, you can share a screen, make a presentation (e.g., created in PowerPoint), use a whiteboard (e.g., Whiteboard), and use breakout rooms to divide students into groups.



Online meetings can also be recorded, and they are saved to MS Stream.

#### 3.2.1.4. Integration between MS Teams and IS (as of January 2023)

Integration between IS and MS Teams is under development. Currently (as of 2022), course teams or seminar groups can be created, and populated using IS. Additionally, an online meeting can be scheduled.

#### 3.2.2. Whiteboard



**Application icon:**

**Help:** <https://support.microsoft.com/cs-cz/whiteboard>

The Whiteboard application can be used as a whiteboard for presentations or as a tool for group work, for example using group rooms.

For the use of Whiteboard in teaching, especially for presentations, the use of a graphic tablet is strongly recommended.

#### 3.2.3. Stream



**Application icon:**

MS Stream is an application for video streaming. It is essentially a corporate equivalent of services like YouTube. In MS Stream, meetings recorded in MS Teams are stored.

When saving videos in MS Stream, it is necessary to be aware of the different levels of file ownership. By default, the "owner" of the file is the person who uploaded it. Ownership of the file does not change after it has been assigned to a channel. Only owners can download files and change their assignment to channels. So, if you want other teachers to be able to manipulate your files, you need to assign them the appropriate rights.

More detailed information can be found directly in the help section of the MS Stream application.

#### 3.2.4. Calendar

The calendar in the Microsoft Office suite is an application that allows users to plan and manage their time. The application allows users to create events, set reminders, share calendars with other users, and synchronise their data with other devices. Users can also add contacts and tasks to the calendar and have an overview of their plans and tasks in one place.

#### 3.2.5. Outlook

Microsoft Outlook is an application for email, calendar, and tasks that allows users to process their mail, plan their time and manage their tasks. The application allows for receiving, sending, and organising emails, adding events to the calendar, setting reminders, and managing tasks. Outlook also provides features for sharing calendars and tasks with other users and synchronising with other devices.



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### 3.3. Google Application

The Google suite of applications also includes several tools useful for e-learning. Within the teaching at the Faculty of Medicine, a combination of IS and Microsoft 365 applications will likely be dominant. However, some Google applications may be a suitable alternative for specific situations.

#### 3.3.1. Google Meet



**Application icon:**

**Adresa:** <https://meet.google.com>

**Nápověda:** <https://support.google.com/meet>

Google Meet is one of the alternatives for online video calls and presentations. Meetings in Google Meet can be scheduled similarly to MS Teams. Each meeting has its own identifier and address, which can be used to connect. When creating a meeting, invitations can be sent by email. Google Meet is integrated with Google Calendar. When an invitation is accepted, the meeting will appear on your calendar.

Google Meet can be useful in situations where colleagues from other institutions need to participate in the meeting. Although MS Teams also offers the option of online meetings with participants across institutions, it is useful to have a backup system as well.

#### 3.3.2. Google Calendar



**Application icon:**

Google Calendar is a web-based calendaring service that allows users to create and edit events, set reminders, and share calendars with other users. It provides an easy way for users to keep track of their schedules, including both personal and work-related events. Google Calendar is accessible from any device with an internet connection, including desktop computers, laptops, tablets, and mobile phones. The service is free for personal use, and it can be integrated with other Google applications such as Gmail and Google Meet. Additionally, Google Calendar allows users to create multiple calendars and colour-code them for easier identification, making it a useful tool for organizing tasks related to different projects or activities.

### 3.4. Other application

#### 3.4.1. Twine



**Application icon:**

**Stránka:** <https://twinery.org/>

**Nápověda:** <https://twinery.org/cookbook/>



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Twine is an open-source application that allows for the creation of interactive, non-linear stories. Its potential use in medical education includes the creation of virtual patients. The stories made on Twine are saved as HTML files, which can be opened on common web browsers.

Twine is available as both a web-based application and a desktop application. If using the latter, the created stories are saved in the documents folder:

```
.../Dokuments/Twine/Stories
```

Creation in Twine is user-friendly, with individual story pages referred to as "nodes," and their connections represented by arrows. Each node can be edited by clicking on it, and connections are created using the target node's name:

```
[[Target node name]]
```

Testing a story is possible on the "Build" tab by clicking on "Test" or "Play," at which point the story is saved. The finished story can be exported from the "Build" tab by clicking on "Publish to file." Although Twine supports advanced functions such as creating variables and simulating randomness through its simple scripting language, basic knowledge of modifying node content and names, and creating connections suffices for creating standard virtual patients for team-based learning.

The resulting story's appearance can be edited under "# Stylesheet" on the "Story" tab.

To achieve a design that aligns with the Masaryk University Unified Visual Style presentations, you can use the following code by inserting it on the "Story" tab under "# Stylesheet" in Twine:

```
tw-story{  
  background-color: white;  
  color: black  
}  
  
tw-link {  
  color: blue;  
}  
  
.visited {  
  color: lightblue;  
}
```



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```
.hover {  
  color: blue;  
}
```

This will set the background colour to white and the text colour to black. Links will be blue, and when visited, they will be light blue. On hover, links will also appear blue. This code can be customised further based on specific design preferences.

### 3.5. Notes on visual style

To ensure consistency in the visual appearance of presentations and written materials, it is important to adhere to the unified visual style guidelines of Masaryk University, which can be found at the following link:

<https://it.muni.cz/sluzby/sablony-muni>





## 4. Teaching Modalities

To provide well-rounded medical education, courses should include both theoretical and practical lessons, as well as communication channels between teachers and students. The courses should be easily transferable between teaching groups, years, and semesters. Blended (hybrid) courses, combining online and face-to-face teaching, offer the greatest possibilities. However, in case face-to-face teaching is not feasible, many teaching modalities can be substituted using available tools. Medical teaching modalities that cannot be adequately conducted online include laboratory exercises, dissection rooms, direct patient contact, including various examination methods and procedures.

This section will provide examples of available tools at the Masaryk University Faculty of Medicine for each teaching modality.

### 4.1. Theory

#### 4.1.1. Digital teaching materials

Tool example	Usage
IS / Working with study materials	Inserting and managing teaching materials
IS / Interactive syllabi	Inserting teaching texts, other teaching materials and links to teaching materials

Digital teaching materials include scripts, teaching texts, and presentations. They can be inserted and managed using the Masaryk University Information System (IS). In addition, the IS allows the manipulation of study materials, insertion of texts, teaching materials, and links to teaching materials.

#### 4.1.2. Video Lectures

Tool example	Usage
IS / Working with study materials	Inserting and managing teaching materials
IS / Interactive syllabi	Embedding video lectures and links to video lectures (e.g. available on MS Stream)
Microsoft 365 / MS Stream	Recording and archiving of video lectures

Video lectures are recorded recordings of lectures and seminars. They can be embedded and managed using the IS, including links to video lectures available on MS Stream. Video lectures can also be recorded and archived using Microsoft 365 / MS Stream.

#### **TIP: Creating pre-recorded video lectures**

Various applications can be used to record video lectures, such as recording presentations in MS Teams or using video recording and editing applications (e.g., Open Broadcaster Studio, OBS Studio). It is necessary to follow the uniform visual style of Masaryk University when creating presentations.



### 4.1.3. Online classes

Tool example	Usage
Microsoft 365 / MS Teams	Conducting synchronous lectures, seminars and online consultations
Microsoft 365 / Whiteboard	Bringing online presentations to life with whiteboards
Google / Meet	Conducting synchronous lectures, seminars and online consultations
IS / QuIS	Bringing online presentations to life with quizzes

Online classes are synchronous lectures and seminars that can be conducted using various tools such as Microsoft 365 / MS Teams or Google / Meet. Whiteboards can be used to enhance online presentations, and quizzes can be integrated into the IS to bring them to life.

### 4.1.4. Online consultation

Tool example	Usage
Microsoft 365 / MS Teams	Conducting synchronous lectures, seminars and online consultations
Microsoft 365 / Whiteboard	Bringing online presentations to life with whiteboards
Google / Meet	Conducting synchronous lectures, seminars and online consultations

Online consultation refers to shorter meetings with students online. They are conducted using the same tools as online lectures, and their aim is to consult a different form of asynchronous learning.

#### **TIP: Combine asynchronous and synchronous learning**

To prevent repeating the same presentations, a combination of asynchronous and synchronous learning methods is recommended. Asynchronously presented materials, such as written materials, presentations, video lectures, practice tests, virtual patients, and homework, can be combined with synchronous tutorials.

## 4.2. Practical Exercises

Medical education requires not only theoretical but also practical exercises. Some of these exercises can be conducted online, while others require in-person attendance. This section provides examples of available tools for practical teaching.

### 4.2.1. Patient demonstration

Tool example	Usage
--------------	-------



IS / Working with study materials	Inserting and managing demonstration videos
IS / Interactive syllabi	Embedding demonstration videos and links to them (for example, available in MS Stream)
Microsoft 365 / MS Stream	Inserting and managing demonstration videos

Patient demonstrations are an essential part of medical education, teaching students to recognize symptoms and make diagnoses. These demonstrations can be used in theoretical lectures, virtual patients, and tests. Tools for embedding demonstration videos include IS, Microsoft 365, and MS Stream.

#### 4.2.2. Practice test

Tool example	Usage
IS / Questions sets	Creating questions for practice tests
IS / ROPOT	Create and administer practice tests

Practice tests are useful tool for learning, and they don't necessarily serve to assess students. They can be used as a stand-alone teaching modality or as an attendance check. IS and Answer Book Management are tools available for creating and administering practice tests.

#### **TIP: Use practice tests as a teaching modality and attendance check**

Create a sufficient number of questions for each topic, and then generate randomised ROPOTS that combine these questions. Students can then take these practice tests repeatedly, and successful completion of the course can be contingent on successfully passing these tests. This approach motivates students to either retake the test or view the available asynchronous texts, presentations, or lectures to obtain the necessary information to pass the tests. When practice tests are well-constructed, successful completion is likely to indicate sufficient mastery of the course material.

#### 4.2.3. Clinical Reasoning

Tool example	Usage
IS / Question sets	Creating questions for practice tests
IS / ROPOT	Creating and administering practice tests
Twine	Creating virtual patients
IS / Homework vaults	Submitting homeworks (e.g. going through Virtual Patients)

Teaching clinical reasoning is a crucial aspect of medical education, particularly in training students in decision-making under uncertainty. It enables students to develop effective diagnostic and therapeutic procedures. Virtual patients can be utilized to teach clinical reasoning through longer stories or short clinical vignettes. Twine is a tool available for creating virtual patients, and IS offers Homework vaults for submitting homework, such as going through virtual patients.



## 4.3. Evaluation

### 4.3.1. Attendance

Tool example	Usage
IS / Interactive syllabi	Checking completion of the Interactive syllabus (function "Přečtenost")
Microsoft 365 / MS Teams	Checking attendance in online lessons (Attendance function)

Attendance is one way of assessing progress through a course, though it is important to note that attendance alone does not necessarily mean a student has acquired knowledge. Checking attendance can be done through several methods, including the "Readability" function in the IS Interactive Curriculum and the Attendance function in Microsoft 365/MS Teams.

### 4.3.2. Assessment

Tool example	Usage
IS / Question sets	Creating questions for practice tests
IS / ROPOT	Creating and administering practice tests

Testing students is another way to assess their successful completion of a course. Final tests and practice tests can be created through the IS Question Sets and ROPOT features. Practice tests, which can be created by generating enough test questions and allowing for retakes, can also serve as useful learning material.

### 4.3.3. Oral examination

Tool example	Usage
Microsoft 365 / MS Teams	Online oral exams
IS / Question sets	Creating sets of exam questions
IS / ROPOT	Drawing questions for the examination

Online applications such as Microsoft 365/MS Teams can be used for online oral exams. For online oral exams, it is important to follow the current methodological guide of Masaryk university.

<https://it.muni.cz/en/services/remote-examinations-at-muni>

#### TIP: Use ROPOT to randomly pick questions for oral examinations

The IS "Question Sets", and "ROPOT" features can also be used to draw questions for the online examination. In this case, question sets of the type "Key shows answer" can be created, containing test questions, and an answer key is created that selects one question from each test set for students registered for the test date. Once a student opens the answer sheet, a question from each exam set is drawn at random, and the student can view the answer by clicking on the key icon.



## 4.4. Organisation

### 4.4.1. Course information

Tool example	Usage
IS / Interactive syllabi	Curriculum and course information, guidepost to all necessary information
IS / Full information on the course	Basic information about the course
IS / Working with study materials	Sharing files with course information

There are several ways to communicate essential course information to students. According to the Methodological manual, it is most appropriate to provide materials in a centralised format (Methodological manual, section 4b). The *"Interactive Syllabi"* application seems to be the ideal platform. The interactive syllabus can contain not only links to the course materials but also links to files with information about the course or directly to such information in text form.

#### **TIP: Provide all essential information about the course in an interactive syllabus**

The following information should be readily available to students:

- Course format (synchronous, asynchronous)
- Course timetable
- In the case of synchronous teaching, the schedule of online sessions
- Course completion requirements
- Ways of communicating with teachers

The so-called *"Introductory Text"* in the interactive curriculum can be used for this purpose.

### 4.4.2. Time table

Tool example	Usage
IS / Interactive syllabi	Course syllabus and information, timetable, online class calendar can be inserted.
IS / Timetable	Course schedules.
IS / Calendar	Individual calendar of the student or teacher according to the course schedule.
Microsoft 365 / Calendar	Can be embedded in an interactive curriculum.
Google / Calendar	Can be embedded in an interactive curriculum.

For synchronous or hybrid courses, students should have a schedule of online and face-to-face classes. Several applications can be used for this purpose.

#### **TIP: How to insert a calendar into an interactive syllabi**

Both Google and Microsoft 365 calendars can be embedded directly into websites and, therefore, into interactive syllabi. The insertion string usually has the following format:

```
<iframe src="Adresa kalendáře"></iframe>
```



The embed code can be obtained in Google Calendar by navigating to Settings and clicking on the name of the calendar that needs to be embedded. In the "Integrate calendar" section, the HTML code can be copied and pasted into the webpage where the calendar should be displayed.

In Microsoft 365 the embed code can be obtained by accessing the calendar that needs to be embedded. "Share" should be selected from the top navigation menu, followed by "Embed this calendar". Then, the configuration can be adjusted as desired, and the HTML code can be copied to embed the calendar on the webpage.

The code can be inserted into the interactive syllabus by clicking on `</>` - i.e. when the source file is displayed.

#### 4.4.3. Communication with students

Tool example	Usage
IS / Mail	E-mail communication. In IS you can use the function of sending a group email.
IS / Discussion forums	Discussion forums for courses and seminar groups.
Microsoft 365 / Outlook	Email client
Microsoft 365 / MS Teams	Online communication both in the form of calls and conversations with individual students or in teams and channels.

Effective communication is essential when designing and implementing online courses. In particular, it is important to establish how students will communicate with both teachers and peers. The Methodological manual provides comprehensive guidelines on the basic principles of communication during online learning (Methodological manual, section 4a-iv), and instructors should ensure that students are aware of the methods of communication that will be utilised.

Various tools are available for online communication, including email, discussion forums, and online communication platforms like Microsoft 365/MS Teams. It is recommended that instructors consider the specific needs of their course and select the most appropriate tools for facilitating effective communication. Additionally, instructors should ensure that clear guidelines are established for online communication, including expectations for response time and etiquette. Effective communication is essential for creating a collaborative and engaging online learning environment.

### 4.5. Additional considerations

#### 4.5.1. Lesson testing and error checking

Tool example	Usage
IS / Interactive syllabi	The "Validation" function checks the allocation of rights and the validity of links.
IS / E-learning from the Student's Point of View	Check how online learning looks from the perspective of the selected student.



Effective e-learning requires that all course components are working as intended for students, including access to all materials, correct allocation of access rights, appropriate timing for hand-ins and tests, and other similar factors. The interactive syllabus functionality can be verified using the "Validation" function. Additionally, teachers can test the course by simulating a student experience to ensure everything is working as intended.

#### 4.5.2. Feedback

Tool example	Usage
IS / Surveys	Creating and viewing subject polls
IS / Question sets	Questions for custom surveys.
IS / ROPOT	Alternative for creating custom surveys using "Question sets"

Gathering feedback from students is an important part of developing an effective e-learning course. The IS platform provides a "Surveys" application for conducting subject polls. Teachers can also create their own survey using the IS test system, where they can create questions and manage respondents. In addition to these tools, Microsoft Forms and Google Forms can also be used for this purpose.



## 5. Guide to Creating an E-learning Course

This chapter provides a simple checklist for creating an e-learning course using the applications available at Masaryk University Faculty of Medicine. This guide serves as an inspiration for your own work, but there are other ways to create e-learning courses. For a broader perspective on e-learning course development, please refer to the Methodology Manual (sections 4, 5 and 6).

### 5.1. Planning

At this stage, you will create the basic concept of the course and choose the building blocks for its construction.

- **Select the type of course:**
  - Will it be synchronous, asynchronous, or hybrid?
- **Select teaching modalities:**
  - What teaching modalities will the course use? (See section 4. Teaching Modalities.)
- **Select individual applications:**
  - What applications will be used in the course with regard to the chosen learning modalities? (See section 3. E-learning tools.)
  - Plan for transferring the course between semesters.
- **Develop the course scenario:**
  - Optimal progression for a model student through the course.
  - Potential problems during the course and how to solve them.
- **Identify the requirements for successful completion of the course.**
  - What will be the course completion requirements and how will students be assessed?
    - Viewing of teaching materials
    - Attendance at synchronous classes
    - Homework
    - Assessments
    - Oral testing
  - Procedure for students who fail to meet course completion requirements.

### 5.2. Preparation of Content

At this stage, we prepare the teaching materials and individual applications that will be used in the course.

- **Prepare teaching materials:**
  - Create teaching texts and presentations.
  - Record video lectures.
  - Prepare test questions and answer sheets.
  - Prepare virtual patients.
  - Prepare ways to enliven synchronous lectures and seminars (e.g., quizzes, voting, etc.).
- **Prepare the application environment for online presentations:**
  - Does the chosen application for online presentations require any preparation? For example, setting up a team in MS Teams and assigning students to a team.
- **Prepare a system for communication with students:**





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- Discussion forums.
- Group emails.
- Teams and channels in MS Teams.
- **Prepare a system for student assessment:**
  - Test questions and ROPOTs.
  - Questions for oral examinations.
  - Channel in MS Teams for oral testing.

### 5.3. Putting it all Together

At this stage, the individual components of the training are integrated into the course itself. In particular, the "Interactive Syllabus" application can be used for this purpose.

- **Create a course outline:**
  - Information about the course.
  - Course timetable.
  - In the case of synchronous teaching, the schedule of online sessions.
  - Course completion requirements.
  - Ways of communicating with teachers.
  - Chapters of the syllabus.
- **Fill in the subject information.**

### 5.4. Testing and Debugging

After creating a course, it is advisable to check that all materials are available to students as planned before launching the course.

- **Check availability of materials:**
  - Use the "Validation" function in the interactive curriculum.
  - Check the course from a student's point of view.
  - Check the functionality of other applications you use.
- **Are students correctly assigned to a team in MS Teams?**

### 5.5. Running and Maintenance

At this stage, the course is deployed in the classroom. Students work on the materials available asynchronously, and synchronous and face-to-face sessions take place. Communication with students is also taking place. In case of problems and errors in the course, it is necessary to make corrections.

### 5.6. Transferring the Course Across Semesters and Its Cultivation

After the course is over, it is time to evaluate it and prepare for the next semester.

- **Copy the course to the next semester.**
- **Make adjustments:**
  - Determine if any materials are obsolete and need modification.



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- Evaluate if any exam or test questions are too easy or difficult.





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## 6. Additional Resources

Methodological Manual for Online Teaching at Medical Faculties.

IS help documentation: <https://is.muni.cz/napoveda/elearning>

Webpage "E-learning at Masaryk University": <https://is.muni.cz/elportal/>

