

# 4 Fit Future

**Far-Future Strategy Development  
for STEM Higher Education Teachers**

**PR2/T1 FIT4FUTURE:  
Digital Learning Materials for STEM Higher Education Teachers**

**14 July 2023**





Co-funded by the  
Erasmus+ Programme  
of the European Union

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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# 1. Analysis Approach

## 1.1 Purpose

HE offerings focus predominantly on educating (future) strategists in developing short and middle term (2-10 years) strategies. Far-future strategic decisions, however, need to be built on a sound long-term technology future scenario (LTFS) development methodology that is different in so far as it needs to consider not just trend forecasts, but also tacit visionary knowledge.

This report aims to determine your knowledge and preferences for digital learning materials used in teaching processes. It is a part of the project FIT4FUTURE grant agreement number: KA220-HED-000032069, implemented with the financial support of the European Union.

## 1.2 Target Group

The target group of this task is STEM HE teachers. A total of 20 participants, 5 participants from each HE partners, were aimed to participate in the data collection process. Their verbal responses helped the project team to understand STEM HE teachers' knowledge and skills, which in turn informed the team to choose appropriate types of DLMs for introducing the course materials. These teachers were chosen from various STEM fields, a random sampling methodology is implemented considering the representation of different fields.

## 1.3 Methodology

To understand the STEM HE teachers' knowledge and skills on DLMs, once the STEM teachers from different disciplines were identified, project teams contacted the person explaining the purpose of the study and received consent from the participants. Then an open-ended questionnaire was administered to collect data through using a cloud-based data collection tool such as Google Surveys.

An open-ended questionnaire was developed by EGE for data collection. Afterwards the questionnaire was reviewed by two experts experienced in qualitative research from each team and the form was finalized upon their feedback. The first part of the questionnaire (Definition of Digital Learning Materials) contained information about DLMs, DLM types and their brief explanations. The second part of the questionnaire included 5 open-ended and one multiple-selection item question.

Once the data was collected from STEM HE teachers, EGE analyzed the data. Content analysis data was coded by two researchers. Then researchers met in a peer-debriefing session to discuss disputes on the coding. Later codes were merged under categories and themes. Data was reported including direct quotes from the participants. Answers to the multiple selection questions were reported as a graph.

## 2. FIT4Future Survey Content

A total of 24 STEM HE teachers, 8 from Universidade da Beira Interior (Portugal), 5 from Syddansk Universitet (Denmark), 6 from Ege University (Turkey), and 5 from Hochschule Der Medien (Germany), participated in the survey. The content of the survey is presented below in two parts. Part 1 reporting the definition of digital learning materials, Part 2 reporting survey questions.

### 2.1 Part 1: Definition of Digital Learning Materials

They are materials presented to students by using different technological tools and applications during the learning process. These materials are often offered through online resources such as e-books, video lessons, PowerPoints, simulations and forecasts, online tests and quizzes and online articles/reports. Digital learning materials play an important role, especially in online education methods such as distance education and distance learning. At the same time, these materials can enable students to have a more engaging and interactive experience in the learning process.

Digital learning materials can be various types. Some of them are;

1. E-books: They are digital books of learning materials.
2. Video lessons: They are materials with short videos on the subject.
3. PowerPoints: It is a combination of several slides that show a graphical and visual interpretation of data to present information in a more creative and interactive way.
4. Simulations and forecasts: Its refers to two types of predictive modeling techniques used to make projections about future events or trends.
5. Online tests and quizzes: They are digital test and exam materials in which the learned material can be measured.
6. Online articles/reports: It refers to written content published on the internet. These can range from news articles and opinion pieces to scientific reports and research papers.

Since these materials can be used in accordance with the student's own speed and level in the learning process, they can be diversified to suit the student's learning style.

### 2.2 Part 2: Survey Questions

- 1) At which stage of the teaching process do you prefer to use digital learning materials (e.g., planning, instruction, assessment)?
- 2) What type of courses do you think is more convenient to use digital learning materials? (theoretical, practical, laboratory, workshop...)

3) What are the factors that affect you in choosing the type of digital material during teaching? (reach to infrastructure, motivating students, etc...)

4) Which digital materials do you prefer while YOU are learning something?

5) Which of the below digital material types do you prefer for learning?

I would not definitely prefer	I would not prefer	I would prefer	I would usually prefer	I would definitely prefer
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a) E-books

b) Video lessons

c) PowerPoints

d) Simulations and Forecasts

e) Online tests and quizzes

f) Online articles/reports

6) If you prefer to use other DLMs in your courses rather than the ones mentioned about, please state them.

### 3. Survey Results

Abbreviations used in the analysis P (Participant); PT (Portugal); DK (Denmark); DE (Germany); TR (Turkey)

#### 1) At which stage of the teaching process do you prefer to use digital learning materials (e.g., planning, instruction, assessment)?

STEM HE teachers preferred the use of DLM at different phases of the teaching process. 11 of the 24 participants stated that they used these materials in all the teaching process (planning, instruction, assessment). For example, P7-PT stated "I prefer to use digital learning materials in all phases of the teaching process. I believe these digital resources can bring numerous advantages to planning, instruction, and assessment. In planning, I like to explore online resources such as educational websites, digital libraries, and virtual communities to gather information and access teaching materials. This helps me enrich my lessons and diversify the activities I propose to students. During instruction, I enjoy incorporating multimedia resources such as videos, interactive simulations, and virtual reality experiences. These materials capture students' attention, making learning more engaging and facilitating the understanding of complex concepts." P3-DK preferred to use DLM at all phases of the teaching process because it performs all its operations in a computer environment. P5-DK stated that it is an advantage to give students digital learning materials before the lessons and predicted "This gives them a preliminary understanding of the subject, which we then can expand on

and discuss in class". P2-DE stated that he/she used DLMs in other phases except for the assessment. P1-TR "I use it for planning my own course materials, during instruction for example for engaging students in activities, through simulations, animations, games etc., and assessment." participants responded as follows and used DLMs in the instruction and assessment phases.

**2) What type of courses do you think is more convenient to use digital learning materials? (theoretical, practical, laboratory, workshop...)**

Digital learning materials were used in different courses. When the participants were asked, 9 of the 24 participants stated that DLMs could be used in all types of courses (theoretical, practical, laboratory, workshop...). However, some STEM HE teachers thought it could only be applied at the theoretical courses, while others thought it could be applied at the practical ones. P3-PT stated that he/she used it in all kinds of courses because she worked in the field of computer science. P7-PT stated "Digital learning materials can be convenient for various types of courses, including laboratory-based, practical, theoretical, and workshop courses. Laboratory-based and practical courses have a higher potential for convenience as digital resources allow for interactive simulations, virtual models, and virtual laboratory environments. This provides practical experiences without the need for physical equipment. However, even in theoretical courses and workshops, digital materials such as educational materials, and online quizzes can enhance the content and offer interactivity and engagement to students. The choice of digital materials depends on the learning objectives, available resources, and student needs." and preferred the use of DLMs at all course types. P1-DK explained that using DLM at the theoretical courses was the most logical option and that he/she used it for students who missed or want to repeat their lessons by video recording during the Covid. He/she also considered it difficult to use DLMs in hands-on learning. P2-DE also stated that these materials were easier to use in theoretical courses and that adapting DLMs is more difficult because applied courses were open to change over time. P2-TR stated as "I think it is convenient to use DLMs for laboratories and workshops where student interaction and co working is necessary."

**3) What are the factors that affect you in choosing the type of digital material during teaching? (reach to infrastructure, motivating students, etc...)**

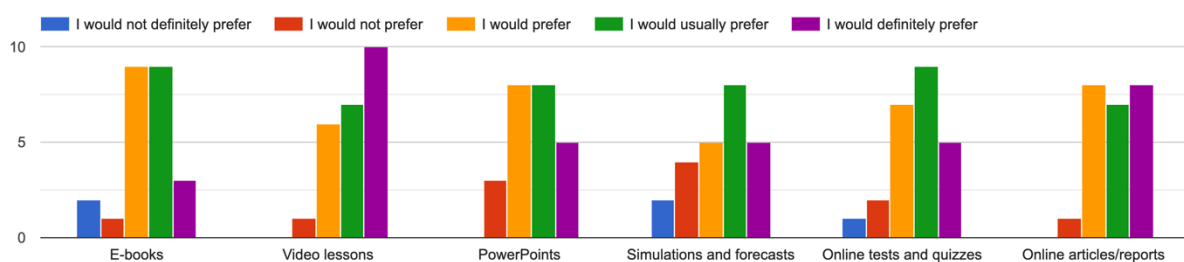
There were some factors that affect STEM HE teachers in the selection of digital learning material. When the participants were asked what these factors were, 15 out of 24 participants thought that motivating students was one of the most important factors. P7-PT stated "Several factors influence the choice of digital learning materials during teaching. The main ones were learning objectives, technological infrastructure, accessibility, student motivation, and relevance to the context. Materials should be selected based on educational goals, considering the availability of technology and internet access, ensuring accessibility for all students, motivating them through interactive resources, and being relevant to their reality. Making appropriate choices of digital materials promotes an effective and enriching learning experience." and explained in detail the factors affecting the choice of DLMs. P5-DK stated that the most important factor for him/her is the quality of the content. He/she thought that both how much students could benefit from this material and how well it fit into the curriculum of the course should be examined thoroughly. P2-DE stated that for him/her that everything depends on the effectiveness of the material and stated that the question should be asked whether the chosen method will really provide sufficient success. P2-TR stated that when DLMs were used in lessons, it generally attracts students' attention, but it is also important for students to have the necessary digital knowledge.

#### 4) Which digital materials do you prefer while YOU are learning something?

A total of 13 of the 24 participants who participated in the survey stated that they benefited from videos during the learning phase. Apart from this, e-books and online articles were also preferred by many participants. P7-PT stated “As a programming teacher, I utilize a variety of digital resources including tutorial videos, code repositories, AI tools like ChatGPT, and programmer social networks such as Stack Overflow and GitHub. These resources allow me to access information, practical examples, solutions to questions, and engage with the programming community. By combining these resources, I gain comprehensive knowledge, improve my skills, and provide quality education to my students.” and stated that he/she benefited from many digital materials. P1-DK stated “I’m a bit old school and would like physical lectures and books. But e-books and online articles are also good. I also use video lessons on e.g., YouTube.” and he/she preferred physical materials more. P2-DK preferred to primarily use scientific articles, even if effective videos could be found. Although P2-DE tended to use Youtube videos at first, he/she always looked at printed books and reported that physical materials were good for him/her. P2-TR stated that learning with videos and simulations was more effective for her.

#### 5) Which of the below digital material types do you prefer for learning?

The participants were asked which digital learning material they preferred during the learning phase in a multiple-choice manner and the results given in the graph below were obtained.



As seen in the graph, all DLMs types were used by different participants in the education process. However, the most preferred DLM type were video lessons which were chosen by 10 participants as “I would definitely prefer” them. In the second place, online articles/reports were chosen by 8 participants as “I would definitely prefer” them. If we make a general evaluation, it was seen that STEM HE teachers generally prefer to use video lessons, PowerPoint presentations and online articles/reports as DLM in their lessons.

#### 6) If you prefer to use other DLMs in your courses rather than the ones mentioned, please state them.

When the participants were asked whether they used a material other than the above-mentioned digital learning materials in their classes, 15 of the 24 participants stated that they did not use different DLMs. Other participants stated different types of DLMs they use. For example, P1-PT used cloud-based development environments such as GitHub Codespaces for coding. P6-PT recommended the use of forums, blogs, and programs such as ChatGPT. P3-DK sometimes preferred different websites in order to increase creativity in its lessons. P2-DE planned the use of DLM in its lessons by doing case



studies in a programming environment. P2-TR stated that he/she is interested in the use of VR materials that have not yet become widespread.

## **4. Conclusion**

The surveys we conducted in four countries provided us with valuable information about the STEM HE teachers' needs for digital learning materials for teaching long-term future scenarios. First, the report concluded that all STEM HE teachers consider DLMs valuable teaching resources, and roughly half of the faculty members used DLM at all phases of instruction. Second, DLM could be used to teach LTFS in a variety of course types. Several participants mentioned the advantages of using DLM in laboratories and workshops, while others stated that contextual factors related to the nature of the course influenced the use of DLMs in various types of courses. Third, STEM HE teachers stated that the primary motivation for using DLM is to motivate students in learning and create a more engaging and effective learning environment. Fourth, STEM HE teachers' digital tool preferences ranged from videos to AI tools, and from e-books to simulations. Fifth, in terms of DLMs, STEM HE teachers stated that video lessons and online articles were their favorites. E-books were identified as the least preferred DLM. Other DLMs included PowerPoints, simulations, and forecasts, online tests and quizzes, cloud-based development environments, forums, blogs, AI technologies, websites, and VR materials. Individual STEM HE teachers, on the other hand, mentioned these additional DLMs. Overall, the findings provided insight into the development of DLMs for STEM HE teachers.