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# acaSTEMy TEACHER ACADEMY

## Work Package 3

### D3.1 Syllabus and training materials for the 'training the trainers' workshop

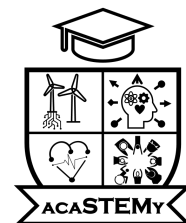
**Prepared by:** Jori Manner, Anssi Salonen, Justus Kinnunen (UEF)

**In collaboration with:** UTARTU, IE-ULisboa, DEU, UL, PILAR, ELTE, LMU, CmapA

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## Introduction

This deliverable reports the two main training events of acaSTEMy-project, namely the Train The Trainers (TTT). These two workshops were held 2.12.2024 and 29.1.2025, both as online training through zoom meeting. TTT call and recruitment was published via project partners and their intra for STEM education teacher educators and researchers. TTT was arranged open access to all interested on the topic. The overall goal was to share expertise and experiences on digital technologies in education and teacher training.

## Workshop design and arrangements

TTT arrangements were conducted mainly by the leading beneficiary (UEF). The work for Train the Trainers planning was postponed due to pushback of Task 2.1. and 3.1. and therefore, not enough information was available from the survey to finalize the plans of TTT before Summer 2024 in time for Autumn 2024 implementation. However, the work for TTT planning was ongoing process, and once the synthesis from the Tasks 2.1. and 3.1. was available, the syllabus of the first workshop was discussed during the consortium meeting in Split (October 2024) and a design workshop was held where the partners discussed the following themes and needs for Train The Trainer development:

### Contents

- What could be the key skills to learn in the TTT sessions?
- What could be the best approach for going through the themes in TTT?
- How would the teachers in your country be interested to participate and learn?
- How to implement different parts of TTT?
- Do we need more knowledge or practice utilizing the learning environments to their full potential?
- Think about how we can integrate the skills/methods/tools to practice.

### Applications or tools to be included:

- What kind of problems there are in the STEM subject?
- How would you tackle these problems with a digital application / tool?

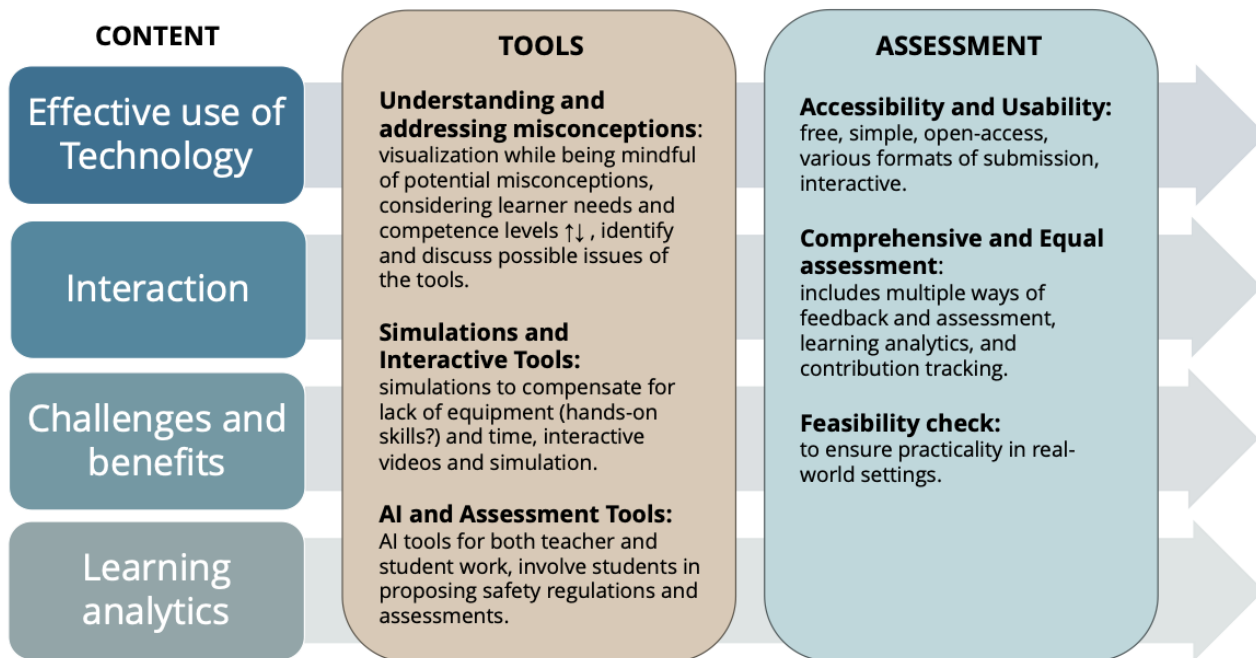
### E-Assessment and E-Testing

- What are the ways of E-Assessment and E-Testing you have used so far?
- What are the benefits?
- What kind of new E-Assessment methods would you like to learn?



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As the result of these discussion, the UEF team proposed a framework for the Train the Trainers (Figure 1). This framework was then agreed across the consortium. The framework guided the following design work of the TTT syllabus and workshop details.



**Figure 1.** Train the Trainers framework.

Instead of autumn 2024 implementation, the first TTT workshop was agreed to be held in 2.12.2024 instead. This postpone turned to be a good choice as the teacher education staff members had much more time to participate on intensive training in the end of semester instead of start of semester.

For the first workshop interesting keynote speakers were invited from the known expertise pool of digitalization. Fortunately, Dr. Vesa Paajanen agreed to speak about his expertise area of learning analytics in learning management systems, Taina Rytkönen-Suontausta presented peer assessment tools and Andreas Fischer, from one of our Associated Partners ThingLink gave us a tour of their immersive learning tool. Revised, final programme (see Annex 1) was agreed few weeks before the workshop by all partners.

The Arrangements for the next workshop started right after the first workshop was finished. All the participants answered a timing survey and the best overall date was set to 29.1.2025. In addition, all the participants in the first TTT was asked for feedback and suggestions of what could be the syllabus of the second TTT. Few suggestions about AI in education, and more hands-on time for e-learning module development were raised. The finalized programme of the second TTT workshop (see Annex 3) was agreed and sent to the partners to share the information with relevant audience and participants.

### Target audience

TTT was planned to keep in mind that the participants already have some knowledge and competence on teaching and learning in digital environment. However, the target audience was much wider, considering all





the STEM teacher education staff, including teachers and researchers in all the partner universities and their networks.

### 1<sup>st</sup> workshop participants

37 participants were from all the partner countries. Females 22 and males 15. Most of the participants were STEM teacher education staff members or researchers.

### 2<sup>nd</sup> workshop participants

26 Participants were from all the partner countries. Females 16 and males 10. Most of the participants were STEM teacher education staff members or researchers.

## Workshop syllabi and details

This section provides an overview of the two Train the Trainer online workshop syllabi, focusing on the Aims, Objectives, Activities and Reflection (Table 1 and Table 2).

As a pre-assignment before the first workshop, participants were invited to join the acaSTEMy Train the Trainers test environment <https://stem-digimanual/ttt> where all the materials of the training will be shared. This environment is open access for guest users to learn about digital tools and resources for teacher education.

### 1<sup>st</sup> workshop 2.12.2024

Table 1. Overview of TTT 1 workshop syllabus

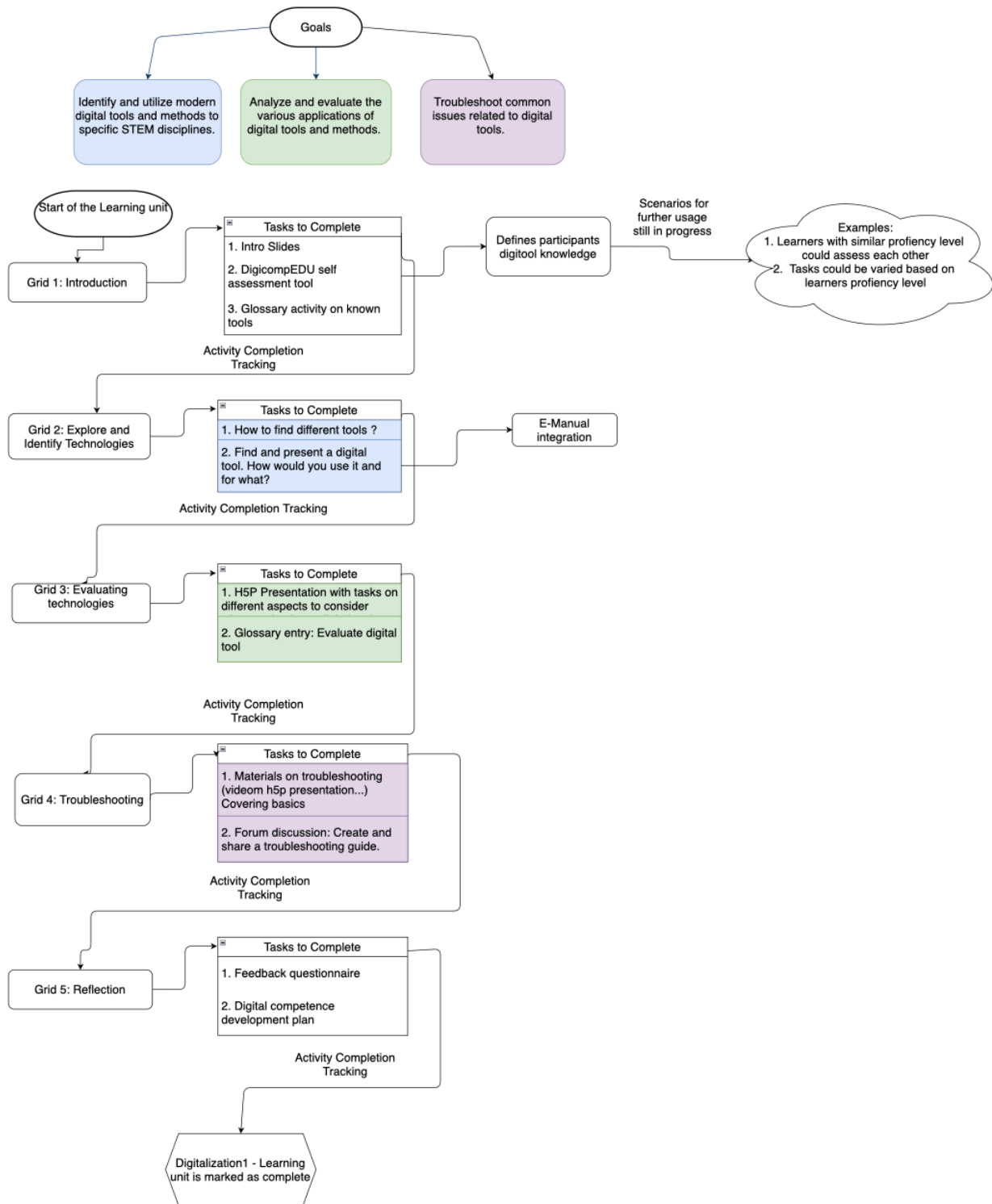
Aim	Objectives	Activity/ tasks / assignment	Reflection / Feedback
Introduce the acaSTEMy test environment	- To introduce the acaSTEMy test environment and digicampus.fi Moodle.	Pre-assignment: Log in to digicampus.fi Moodle environment and acaSTEMy test platform. Get to know different activities in there.	Participants were provided possibility to ask question on implementing tools provided in the platform after the TTT session.
Introduce Learning analytics as part of digital learning	- To develop awareness of different learning analytics theoretical framework - Identify different methods and logging of Moodle learning analytics	Keynote and practical examples by Dr. Vesa Pajananen (UEF)	Questions and comments from the audience.
Introduce peer assessment as part of digital learning	- To introduce workshop activity in Moodle - To apply workshop activity as asynchronous peer assessment as part of	Keynote and practical examples by Taina Rytkönen-Suontausta (UEF)	Questions and comments from the audience. Clarifications of the requirements and barriers of using the workshop tool in asynchronous study units were identified.



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	modules and learning units in the project.		
Introduce ThingLink immersive digital learning tools	<ul style="list-style-type: none"> <li>- To identify the needs of immersive presenting tool attributes for the project</li> <li>- To apply AI scenario building tool for STEM teacher education practices</li> </ul>	Keynote and practical examples by Andreas Fischer (ThingLink)	Questions and comments from the audience. Discussion about the diagnostics assessment and learning analytics possibilities. In addition, tips for embedding and linking with Moodle were provided after questions.
Walkthrough of the acaSTEMy test environment	<ul style="list-style-type: none"> <li>- To introduce the test environment</li> <li>- To provide participants with practical tools</li> </ul>	Presentation of the environment by Jori Manner (UEF)	The platform was found clear, with no more comments at this stage.
Co-development of modules	<ul style="list-style-type: none"> <li>- To understand the sustainability and accessibility of the modules under development.</li> <li>- To share knowledge and practices across consortium</li> </ul>	Working in Groups: module co-development towards sustainable micro-credentials	Partners expressed that more time for collaboration is needed.
Introduce current draft of e-manual	<ul style="list-style-type: none"> <li>- Get perspectives from the partners about the e-manual development.</li> </ul>	The current draft of the e-manual was described and presented by Justus Kinnunen (UEF)	No feedback or comments at this stage.

Between the workshops, partners had an opportunity to ask questions about what the current barriers and challenges for digital learning implementations are. In addition, they had two mid-assignments between the workshops: 1. Discuss the e-manual draft and provide key points of what resources and pedagogical approaches the e-manual should cover, and what structural suggestions for e-manual they would like to propose. The first assignment is reported in D3.2 (e-manual). 2. Create a draft of their first MCC learning unit (Task 4.5): transversal, digitalization, diversity & inclusion, green deal, health & medicine. Partners presented their best practices for their first drafts of MCC learning units in different ways. For example, the digitalization learning unit was presented in a flowchart form, describing the overall learning unit structure (Figure 2) and the Diversity and Inclusion learning unit was structured in the Moodle environment with different activities already developed and visible (Figures 3-5).



**Figure 2.** Overall flowchart structure of digitalization learning unit planned between the TTT workshops (UEF).

## ▼ Awareness and Sensitization to Diversity and Inclusion in STEM



### Objectives:

- Understand the significance of diversity and inclusion in STEM.
- Identify barriers and challenges faced by underrepresented groups.

### Content:

#### 1. Theoretical Foundation

- Introduction to key diversity and inclusion concepts (videos, articles, case studies).
- Analysis of current statistics on diversity in STEM.

#### 2. Reflection Activity

- Discussion prompt: "Why is diversity essential in STEM?".

#### 3. Case Studies


- Vignettes, Examples of barriers and successful diversity and inclusion initiatives in STEM education.

**ASSIGNMENT**  
1. Let's get started

View  
Make a submission

Please take 5 five minutes for yourself, to reflect about your understanding of Diversity, Equity and Inclusion and note it down in a few sentences.

Then, compare your understanding of Diversity with the Diversity Wheel proposed by the Johns Hopkins University. Reflect on the different dimensions of diversity. Here are some questions that could support your reflection:  
Did you include all these dimensions?  
Had the visibility of the dimensions an influence on the dimensions you considered?  
Had your understanding of inclusion an influence?



Headmap for Diversity, Equity, Inclusion, and Belonging | 7

Figure 3. Draft of the introduction to learning unit of Diversity and Inclusion (LMU)

▼ Exploring Diagnostic Tools for Diversity and Inclusion ✎



**ASSIGNMENT** Make a submission

**1. Diagnosing in STEM Lessons** ✎

Familiarize yourself with the various diagnostic tools in the **Prezi environment**.

Create notes for yourself (please do not copy and paste from the Prezi, but make your own notes) about different possibilities of diagnostic in STEM lessons and upload it here.

🔒 Not available unless: The activity **5. What is an inclusive classroom?** is marked complete

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**ASSIGNMENT** Mark as done

**2. Working on a real-world scenario** ✎

Review and analysis of sample data from STEM educational settings. (Practice exercises using real-world scenarios, vignetts and sample datasets.)

Describe the reason for this situation/misunderstanding in the lesson.

🔒 Not available unless: The activity **1. Diagnosing in STEM Lessons** is marked complete

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**ASSIGNMENT** Make a submission

**3. Conducting a Self-Reflection on Diversity, Equity, and Inclusion** ✎

**Instructions:**


- Analyze Your Self-Perception:**
  - Write down your spontaneous understanding of the terms "Diversity," "Equity," and "Inclusion."
  - Reflect: In what situations have you consciously considered these values? Where could you be more intentional?
- Reflect on Personal Experiences:**
  - Describe a situation from your professional or personal life where you encountered diversity (e.g., cultural, social, or gender diversity).
  - Analyze how you responded in this situation and whether your behavior was inclusive and respectful.
- Identify Personal Biases:**
  - Think about whether you've ever made assumptions about people based on their background, gender, abilities, or other characteristics.
  - Write down these assumptions, reflect on where they may come from, and consider how they might influence your actions.
- Identify Areas for Improvement:**
  - Note three specific steps you can take to act more inclusively and mindfully in the future.
- Develop a Vision for the Future:**
  - Set a personal goal for how you want to integrate diversity and inclusion principles into your daily life more effectively.

**Submission:**  
Write a summary (approximately 1-2 pages) of your insights and goals from the reflection. Submit this document in the required format.

🔒 Not available unless: The activity **2. Working on a real-world scenario** is marked complete

Figure 4. Draft of the assignments in the learning unit of Diversity and Inclusion (LMU)


▼ Implementing Diversity and Inclusion Strategies in STEM Education



ASSIGNMENT  
1. Developing Inclusive Practices

Make a submission

Please watch the video and review the overview image, then answer what you think about UDL in relation to schools.



Not available unless: The activity 3. Conducting a Self-Reflection on Diversity, Equity, and Inclusion is marked complete

OPEN FORUM  
2. Practical Application (Scenario-based assignments)

Start discussions: 1  
Post replies: 1

1. Create an action plan for inclusive STEM teaching.
2. Submit and receive peer feedback in an online forum.

Not available unless: The activity 1. Developing Inclusive Practices is marked complete

Figure 6. Example of approaching theory-practice gap in the learning unit of Diversity and Inclusion (LMU)

2<sup>nd</sup> workshop 29.1.2025

Table 1. Overview of TTT 2 workshop syllabus

Aim	Objectives	Activity/ tasks / assignment	Reflection / Feedback
Introduce latest advancements of AI in education	<ul style="list-style-type: none"> <li>- To develop awareness of different AI approaches in digital learning</li> <li>- To understand what the challenges, barriers and possibilities of AI are</li> <li>- To apply latest AI tools for acaSTEMy teaching-learning</li> </ul>	Keynote and practical examples by Prof. Teemu Valtonen (UEF)	Questions and comments from the audience. Participants provided at least 3 new AI tools for the pool of technologies.
Introduce acaSTEMy MCC structure in Moodle	<ul style="list-style-type: none"> <li>- Briefly introduce project staff how the MCCs and learning units could be utilized in Moodle</li> </ul>	Subcourse tool presented and the overall structure explained and demonstrated by Dr. Anssi Salonen (UEF)	No questions or comments on structure. Project coordinator (UT) proposed that the overall structure needs to be once more explained in separate meeting for everyone.
Implementations of learning unit online materials	<ul style="list-style-type: none"> <li>- To share knowledge and best practices across consortium</li> </ul>	Short presentations on asynchronous implementations of learning unit online materials by each learning unit leaders and teams (UEF, UT, LMU ELTE, IE-Ulissboa)	Teams presented the implementations in various ways. Some showed the structure as flowchart, some illustrated the overall structure and some concentrated on single activities or content of their units.
Learning unit development towards sustainable micro-credentials	<ul style="list-style-type: none"> <li>- To understand the sustainability and accessibility of the modules under development.</li> <li>- To develop further asynchronous, assessment, and interaction activities of the acaSTEMy Micro-credentials.</li> </ul>	Working in groups, sharing best practices across learning units. Getting to know other learning unit practices. Co-developing the learning units further.	Each learning unit teams represented some new insight that they just learned during this TTT workshop. Most of the participants expressed that it is important to see how others have created their units and see the actual practical activities in Moodle environment. Teams were in different phases of the development. Thus, creating a flowchart of the units were considered important.



## Workshop Outcomes and follow-up

Participants in the Train the Trainers program were introduced to a centralized platform that integrated various digital tools through pre-assignments, keynote presentations, and group work activities. The platform was well-received, with participants appreciated the practical tools provided.

The keynote presentations gathered positive feedback, being described as both useful and relevant to current educational practices. The introduction of AI tools and immersive learning technologies offered valuable insights, broadening participants' understanding of innovative teaching methods. Peer-to-peer sharing and team presentations further highlighted creative approaches to teaching and learning, while the interactive workshops fostered active participation and meaningful knowledge exchange.

Participants gained hands-on experience using different digital tools. During these activities, challenges and barriers related to asynchronous peer assessment were identified, particularly around the need for clear criteria and rubrics. The sessions also emphasized AI's potential in education and the importance of developing sustainable, accessible learning modules. Sharing diverse implementation methods across teams provided valuable perspectives on structuring effective learning units.

Feedback indicated a strong desire for more time dedicated to collaboration during module and learning unit development. Participants expressed the need for guidance on the use of specific digital tools. Additionally, further clarification of the overall structure of the Micro-Credentials (MCCs) was requested. To address this, participants suggested creating a flowchart to visualize the development process of learning units. The opportunity to ask questions and engage in discussions was highly appreciated. These insights and suggestions will be considered in planning the next steps.

## acaSTEMy test and share Moodle-environment

For the Train the Trainers a Moodle environment was created to learn, share, test and reflect different digital learning activities. This <https://stem-digimanual/ttt> platform is now open for all guests to join. The platform (Figure 6) will serve as learning platform, but also as a testing environment for the project partners.



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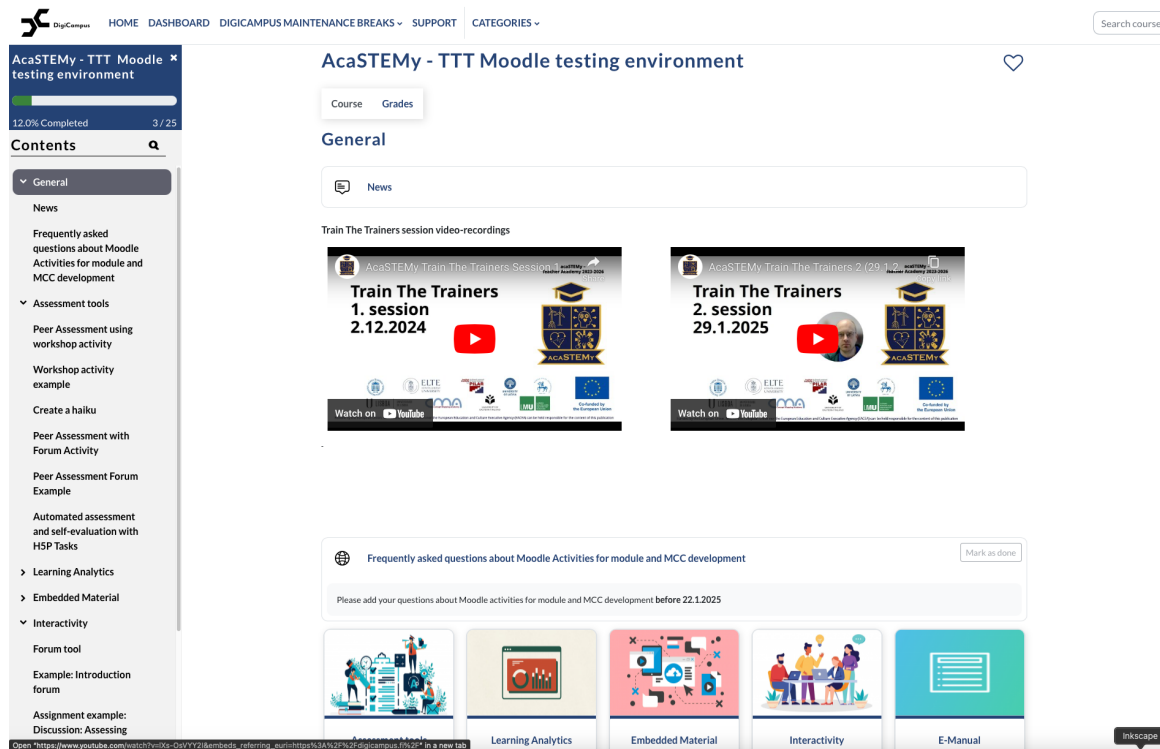


Figure 6. acaSTEMy Train the Trainers learn, test and share platform.

### Slides and video-recordings

TTT 1 keynote speaker Dr. Vesa Paajanen slides are provided in Annex 2. The second and third keynotes did not have any slides to provide, but they shared their screens during the zoom meeting to provide much more practical perspective on their topic. The video recording of the TTT1 can be found open-access on acaSTEMy YouTube-channel and straight link to the video is here: <https://youtu.be/IXs-OsVYY2I>

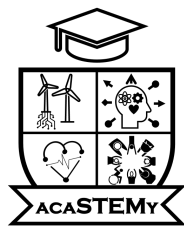
TTT 2 keynote speaker Prof. Teemu Valtonen slides are provided in Annex 4. The video recording of the TTT2 can be found open-access on acaSTEMy YouTube-channel and straight link to the video is here: [https://youtu.be/6tAIUR\\_GhH8](https://youtu.be/6tAIUR_GhH8)

### Follow-up and helpdesk-hours

The Train the Trainers sessions marked an important step in equipping participants with the foundational knowledge and tools necessary for developing high-quality teaching-learning modules (Task 4.1) and micro-credential learning units (Task 4.3-4.4). The interactive nature of the sessions fostered collaboration and introduced innovative approaches to digital education. However, we recognize that short training sessions alone are not sufficient for comprehensive mastery of the tools and concepts introduced.

To address this, we will be offering bi-weekly 30-minute help desk sessions to provide continuous support. These sessions will serve as a platform for participants to ask questions, troubleshoot challenges, and receive guidance on module and learning unit development. This ongoing support aims to bridge any gaps





left by the initial training and ensure participants have the resources they need to apply their knowledge effectively.

This aims to give practical support while ensuring that participants can confidently apply what they've learned. By fostering a continuous learning environment, we aim to facilitate the successful development of robust, accessible, and sustainable learning units.



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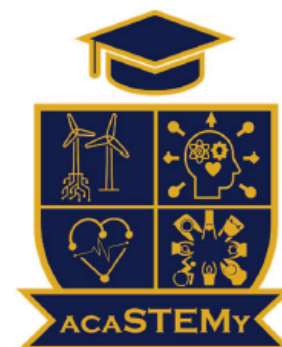


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## Annex 1. Programme of the first TTT workshop

### TTT WORKSHOP AGENDA

- Location: [Zoom](https://uef.zoom.us/j/67301692094?pwd=43WwIE2KbHyW60cqruy8M1bJazkb2y.1)  
<https://uef.zoom.us/j/67301692094?pwd=43WwIE2KbHyW60cqruy8M1bJazkb2y.1>
- Date: 2.12.2024
- Time: 14.30–17.00 (GMT +2)
- Participants Science education and Teacher Education staff who are involved in module and micro-credential development



#### PRE-ASSIGNMENT FOR THE TTT WORKSHOP

Sign (and create account) to DigiCampus and access the Moodle platform with following links:

[DigiCampus login page](https://digicampus.fi/login/index.php) (<https://digicampus.fi/login/index.php>)

[Moodle page](https://digicampus.fi/course/view.php?id=5782) (<https://digicampus.fi/course/view.php?id=5782>)

#### SCHEDULE

14.30–14.35 Start of the Workshop

14.35–15.00 Learning Analytics - Vesa Paajanen

Presentation and discussion on the benefits and practices of learning analytics in teaching

15.00–15.25 Peer Assesment - Taina Rytönen-Suontausta

Practical introduction to the Moodle workshop activity

15.25–15.50 ThingLink Scenario tool - Andreas Fischer

15.50–16.10 Walkthrough of the Moodle testing environment (DigiCampus)

16.10–16.20 Module Working Groups: group leaders present the current Module implementation plans for participants (co-developers)

16.20–16.50 Module Working Groups: module development towards sustainable micro-credentials

16.50–17.00 E-Manual Presentation and Session Wrap-Up



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## Annex 2. Keynote slides of the First TTT workshop



# acaSTEMy LEARNING ANALYTICS

## - Train the trainers -workshop

Vesa Paajanen, UNIVERSITY OF EASTERN FINLAND, 2.12.2024

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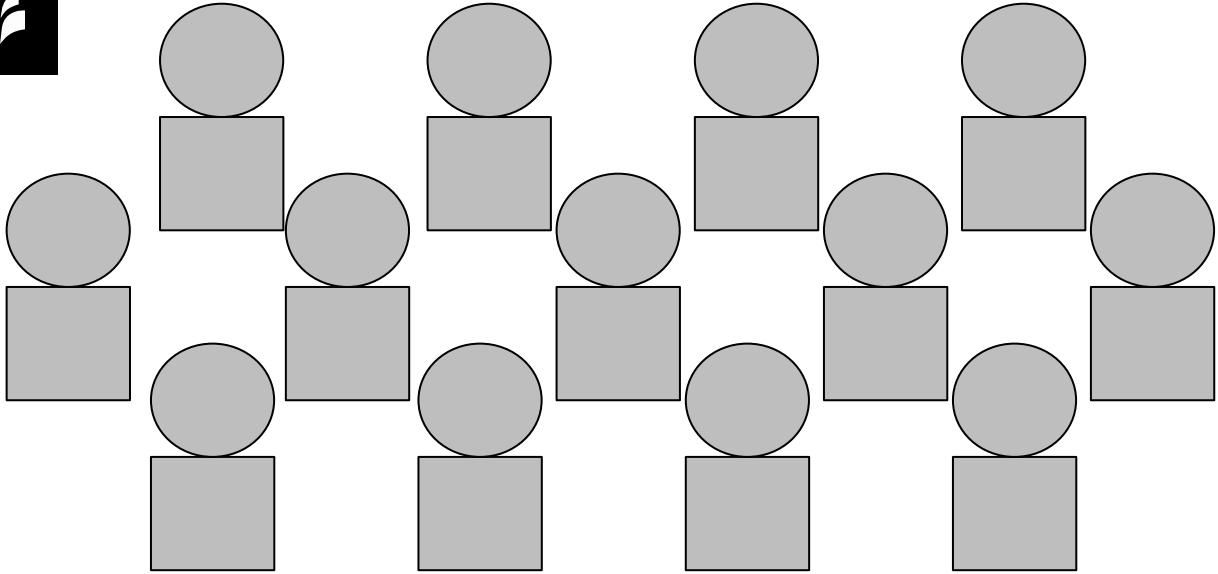
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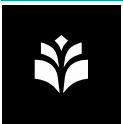
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### Guy Collageguy



- Wil do what the teacher ask
- Get stressed, if instruction is unclear
- Miss school type education

### Rita Researcher



- Highly motivated
- Wants to focus
- Know all the basics already

### Wes Workingman

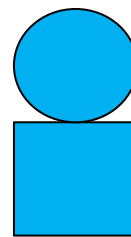
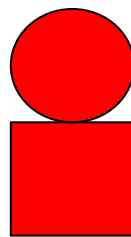
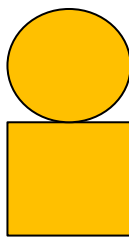
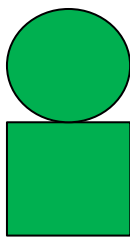


- Work related limitation for study work
- Prior knowledge
- Forgotten learning skills

### Urin Undecided



- Do not know, what he wants
- Weak learning results
- Can get motivated, when find interesting study content



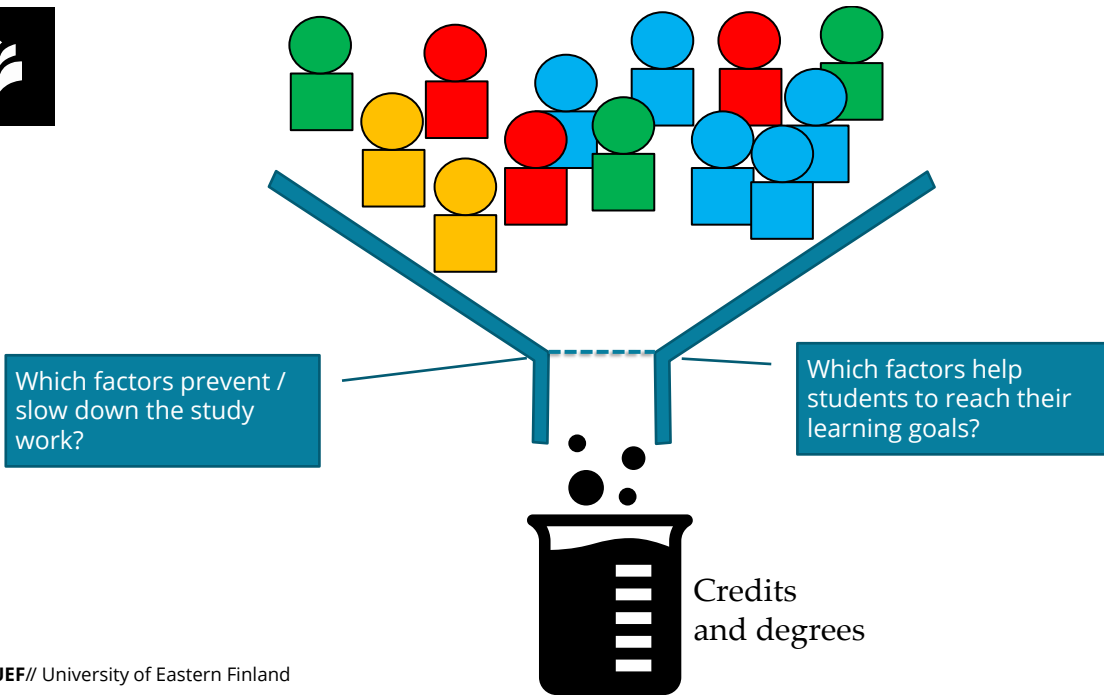
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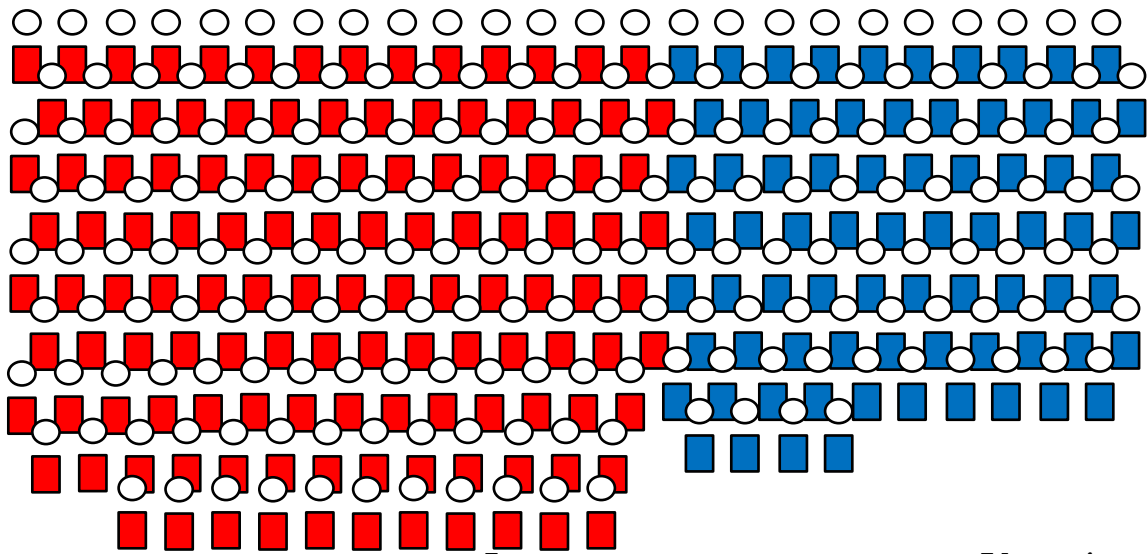
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## How can we find and help the students with challengers?

Problem	
No course progress	Can student find the course platform and assignments? Is student willing to study the course?
Slow course progress	Is student too busy for the schedule? Is student doing too much work for assignments? Is the timetable of the course easy to find?
Low scores	Has students misunderstood the assignment? Is the importance of assignments clearly described in the LMS? Does student have access into assignments scores / feedback / model answers

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## What is learning analytics?

“the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs”

SOLAR 2011 Call for papers of the 1st international conference on Learning Analytics & Knowledge

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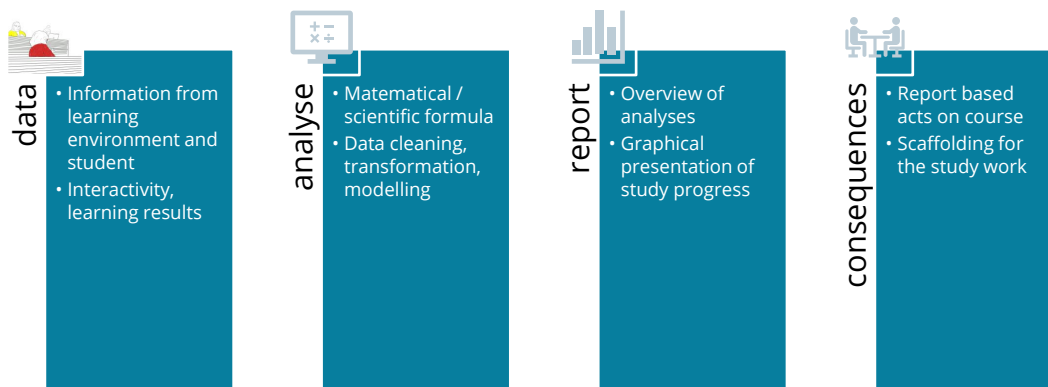
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## Steps of learning analytics

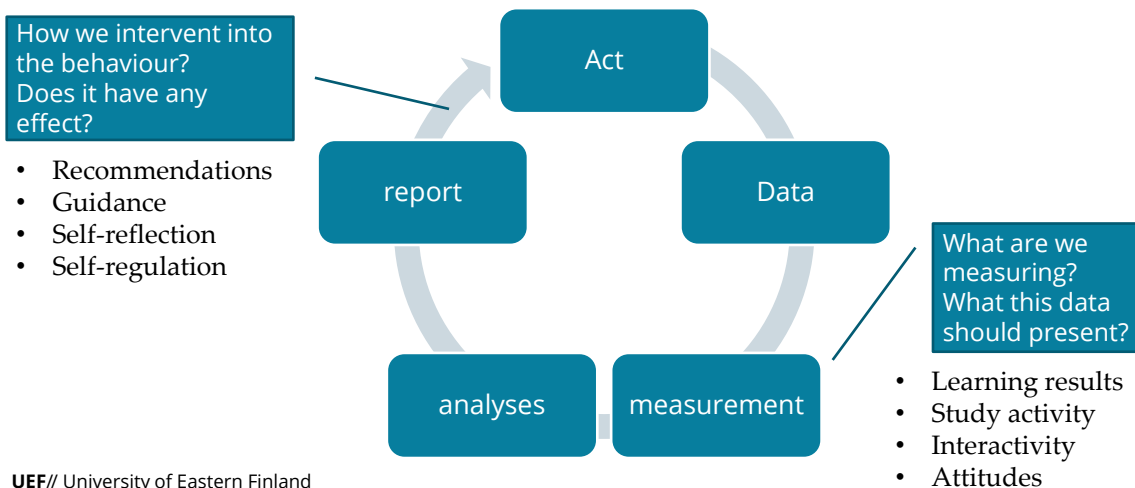


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Mougiakou et al 2023 *Learning Analytics. In: Educational Data Analytics for Teachers and School Leaders. Advances in Analytics for Learning and Teaching. Springer, Cham.*



## Learning analytics is a cyclic process



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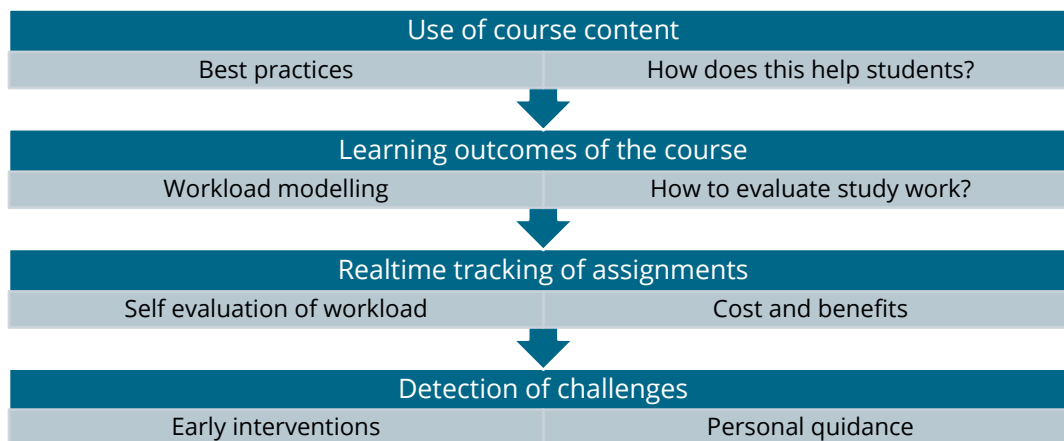


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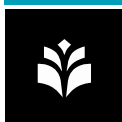




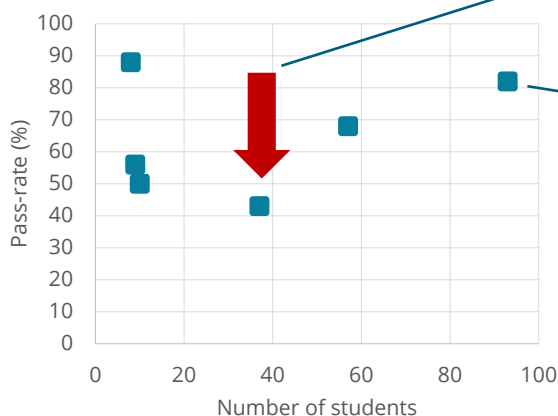
## Reasons to use Learning analytics on the course level



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## Analytics is simple



One relatively large student group had higher drop-out-rate

I had onsite meetings with all other large student groups

Test, if pass-rate can be increased with interactivity

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## Data & measurement

Moodle offers raw and ready-made analytics for teachers:

1. Log files (far from user friendly)
2. Reports
3. Completion tracking

Remember, that some parameters outside Moodle use could also be useful

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MÜNCHEN



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## Log files

A typical log file contain 5000 - 50000 rows of data

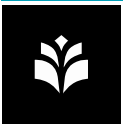
	A	B	C	D	E	F	G	H	I	J
1	Aika	Koko nimi Aff	ctetu	Event cont	Componer	Tapahtum	Kuv	is	Origin	IP-osoite
2	#####	Vesa Paajä-		Kurssi: Kel	Lokitiedot	Log report	The user	w	web	156.208.121
3	#####	Vesa Paajä-		Kurssi: Kel	Järjestelm	Course vie	The user	w	web	91.156.208.121

date      User      Course module      Module class      User acts      computer?

Events in chronological order

Users, modules, days etc

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## Reports

### UEF Environmental Adaptation of Animals

Course Settings Participants Grades Reports More

Back to course

#### Reports

- Activity report
- Course participation
- Activity completion
- Statistics
- Grades chart
- Content accesses
- Number of active students
- Hits distribution
- Event monitoring rules

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# Are these useful?

## Kurssin ylläpito

Kurssin ylläpito Käyttäjät Raportit

- Activity report
- Course participation
- Activity completion
- Statistics
- Grades chart
- Content accesses
- Number of active students
- Hits distribution
- Event monitoring rules

- Aktiveittiraportti
- Kurssiosallistuminen
- Aktiveitteiden suoritus
- Tilastot
- Arvosanaaavio
- Materiaalien avaukset
- Aktiivisten opiskelijoiden lukumäärä
- Aktiivisuuden jakaantuminen
- Tapahtumien seurantasäännöt

### Aktiivisuuden jakaantuminen

Kurssi: UEF: Kehitysbiologia  
Kurssin aloituspäivämäärä: ke, 6 touko 2020, 00:00

arssiosumia	Käyntipäiviä	Viikoittainen käyntipäivien lukumäärä (Viikkojen lukumäärä: 151)	Avattuja materiaaleja	Materiaalien avaukset viikottain
1			0	
5			11	
10			12	
17			34	
2			1	

[Työpöytä / Omat kurssini / UEF:KEBI / Raportit / Tapahtumien seurantasäännöt](#)

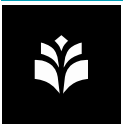
### Tapahtumien seurantasäännöt

## Ei näytettävää

[Lisää uusi sääntö](#)

Voit tilata sääntöjä sivulla [Tapahtumien seuranta](#).

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# Activity completion



Lataa taskintähtäilö-muodossa (UTF-8.csv)  
Lataa Excel-yhteensopivassa muodossa (.csv)

Raajojen kehitys es	Sukupuolien määrä	Ei-istunutta	kehittyminen	ympäristö	kehitys ja ympäristö	ja yksilön	kehitysbiologinen	la	Kantaosuus	kehitysbiologinen	Kantaosuus	esitetään	vertaustulokset	se	ympäristötekijät	ja yksilönkehitys	Suoritetty	Kesken
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	51	19
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	18	6
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Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	4	25
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	31
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	2	2
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	21
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	11	30
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Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	18	6
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Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	31
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	17	7
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	3	29
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	17	7
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	13	11
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	4	25
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	1	30
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	31
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	4	25
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	31
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	0	31
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	18	6
Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	Suoritetty	4	25

### How many activity is finished

2023 17:55

2022 10:59

2022 17:39

2023 12:06

Suoritetty 18.3.2022 13:11 Suoritetty 18.3.2022 13:38

Suoritetty 8.3.2023 14:34 Kesken

Suoritetty 14.3.2023 15:24 Suoritetty 16.3.2023 14:32 Suoritetty 20.3.2023 11:06

Suoritetty 17.3.2023 8:53 Suoritetty 17.3.2023 11:05 Suoritetty 17.3.2023 12:13

Suoritetty 15.3.2022 14:41 Suoritetty 15.3.2022 16:44

Suoritetty 24.3.2022 12:34 Suoritetty 25.3.2022 17:52

Suoritetty 17.3.2022 19:21 Suoritetty 17.3.2022 19:22

Suoritetty 14.3.2023 10:17 Kesken

Suoritetty 24.3.2022 19:24 Suoritetty 25.3.2022 11:17

Suoritetty 30.3.2022 20:29 Suoritetty 2.4.2022 15:11

Suoritetty 20.3.2023 20:52 Kesken

Suoritetty 22.3.2023 9:49 Suoritetty 15.3.2023 9:24 Suoritetty 16.3.2023 12:11

Suoritetty 25.11.2022 10:15 Suoritetty 25.11.2022 10:15

Suoritetty 21.3.2023 8:46 Kesken

Suoritetty 14.3.2023 10:07 Kesken

Suoritetty 18.3.2023 17:06 Suoritetty 17.3.2023 16:01 Suoritetty 17.3.2023 16:23

Suoritetty 18.3.2023 11:14 Kesken

Suoritetty 21.3.2023 13:07 Suoritetty 21.3.2023 13:07

Suoritetty 20.3.2022 17:21 Suoritetty 20.3.2022 18:17

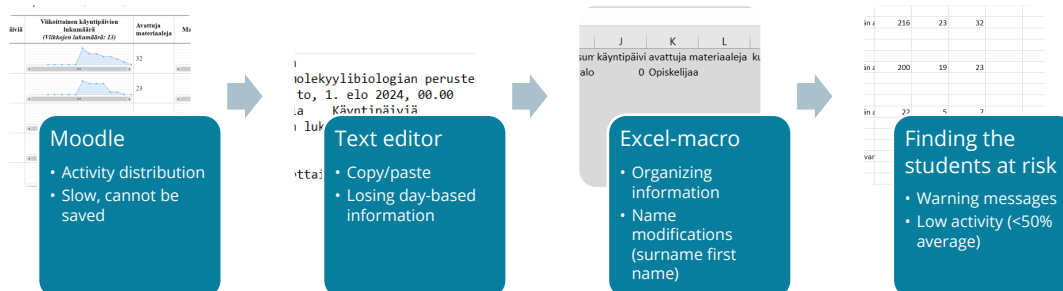
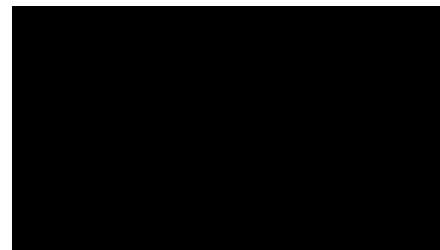
Suoritetty 18.3.2023 11:35 Suoritetty 20.3.2023 17:29 Kesken

When the activities has been done?

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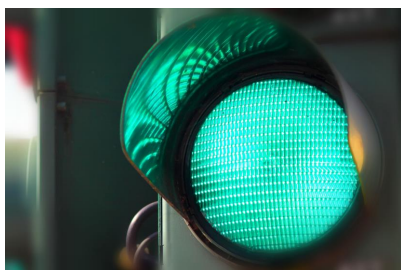
## Activity distribution



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## Complementation tracking



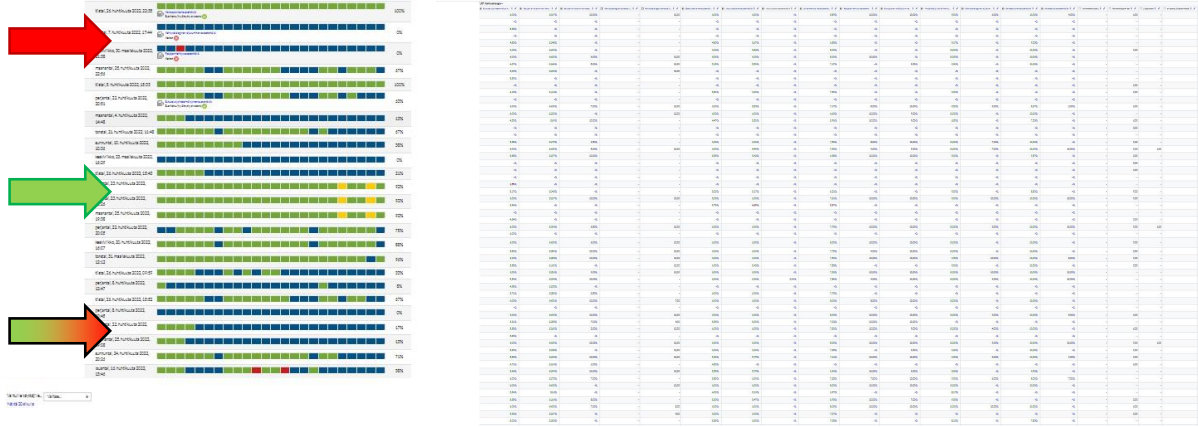
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# Traffic control



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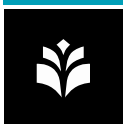
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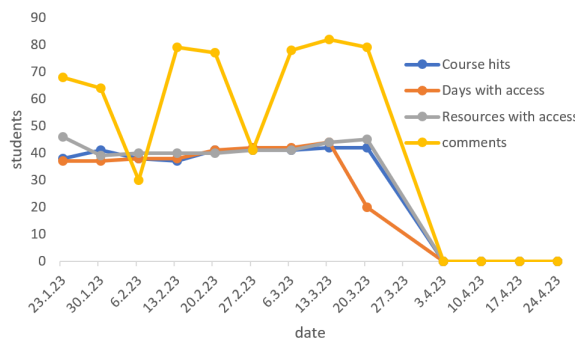
## Reliable data

Criterion	Meaning	Challenges
Completeness	No gaps in the information	Are several students using the same ID
Consistency	Information can be combined	Can we get the date in the same format
Accuracy	Information is right and describe what it should demonstrate.	Has student rewatched video to learn more or because of network problems?
Timelines	Information available on the right time	Total activity is not available before the course ends.
Validity	Data can be justified well and it describe the reality	How to check the errors of the data?
Uniqueness	Information does not have duplicates	When student log in in LMS and start activity, Log file wil have 2 lines of information.

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## Activity distribution: problems with warning messages

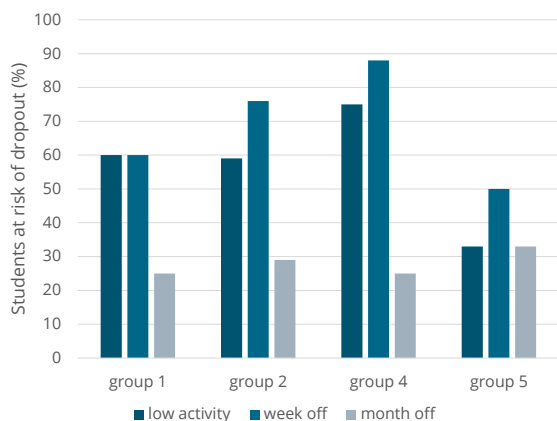


- Activity distribution gives a list of student who have not used Moodle within the last week.
- This list was compared with students below 50 % average activity.
- Low activity has a steady number of students whereas list of students at risk of dropout had almost every students during several weeks.
- Periodical activity is common in this master level course.

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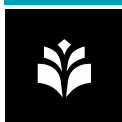


## How to detect the students dropping out?

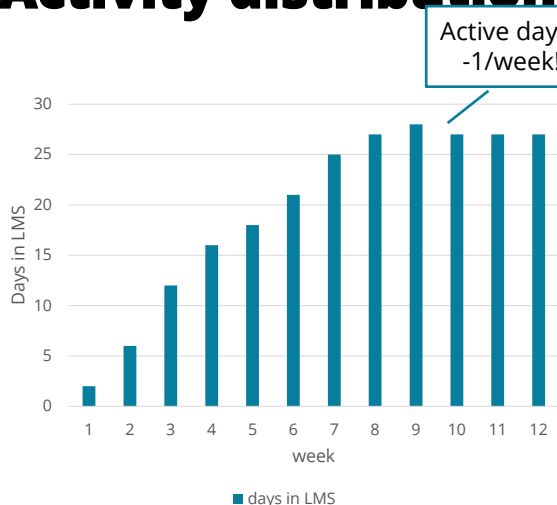


- Moodle can send teacher a list of students not used the LMS within last month.
- The number of students in this “students at risk” is drastically smaller than in lists of low-activity or “off-line for one week”
- Even worse, it contain students who has been active earlier during the semester.
- Therefore, teacher actions are needed not only to send the messages but also evaluate the activity of each students.

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## Activity distribution: Validity problem



- Activity distribution calculate on how many days student has used the LMS.
- In some measurements, active days has negative value, which is naturally impossible.
- Therefore, Moodle calculations give guiding and approximate information, but it is not a valid method for all purposes.

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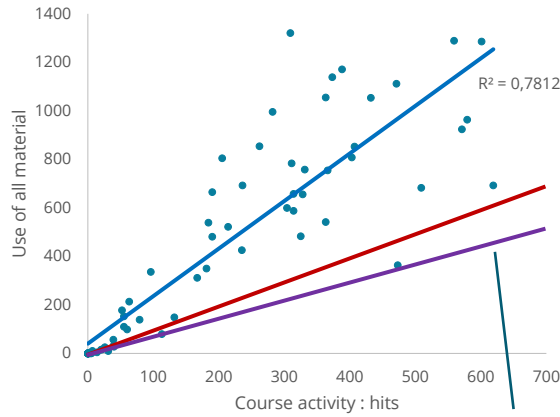


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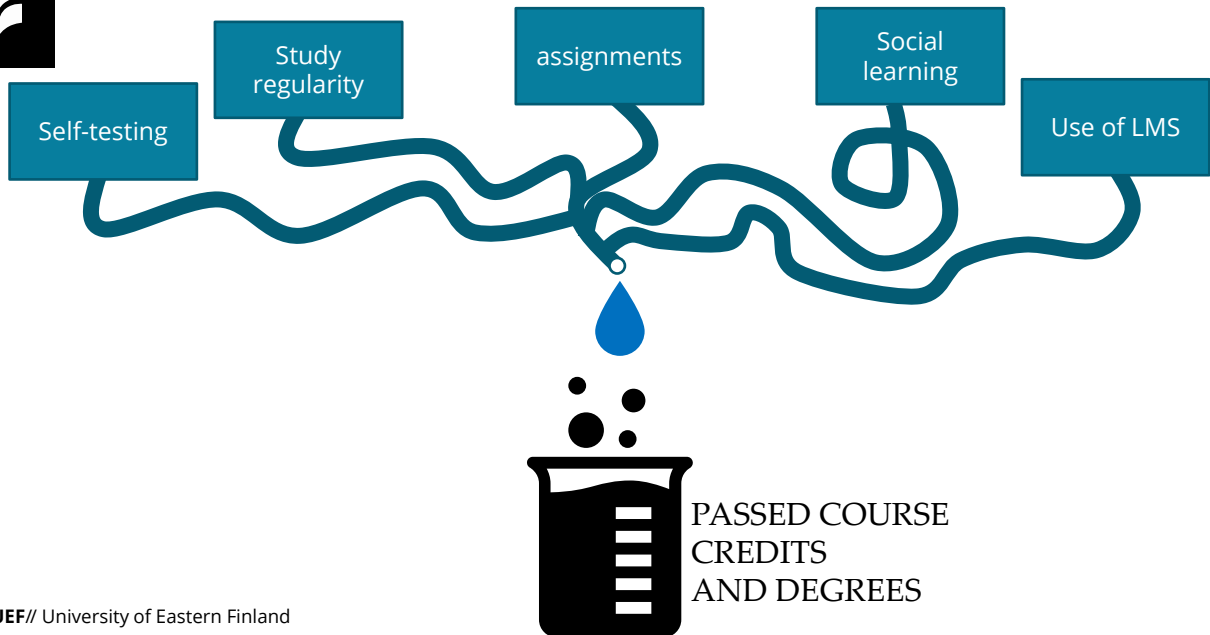
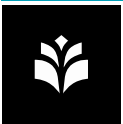


## All LMS activity: Accuracy problem



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- In spring 2023 I followed activity of 68 students weekly with activity distribution.
- Activity distribution give information on all LMS activity (Hits), Opened material and active days
- Activity in individual course elements was measured with course participation and used for sum to calculate use of all material
- Moodle calculations differentiated between ways of measurements



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## Case:

### Learning analysis on 1<sup>st</sup> year bioscience studies:

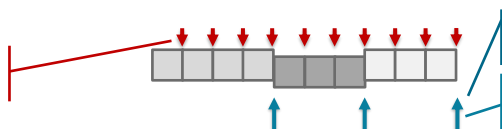
- LMS log data
- Static data (sex, study years, study focus, campus)
- Participation on interactive elements of the course
- Learning outcome
- Correlations + regressions

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## Summative & formative assignments

Failure in a single assignment?  
Try again!



Failure? Welcome next year

Failure in A+B+C?  
Welcome next year

### Summative

- “old tradition” easy for teacher
- Control & distrust
  - Limited ways to test
- Lack of feedback
- Order of “knowledge”
- Bulimia pedagogy

### Formative

- Time consuming
- Authority & cheating
  - Freedom of arrangements
- Feedback & discussions
- Assessment as a part of learning
- Empower & guidance

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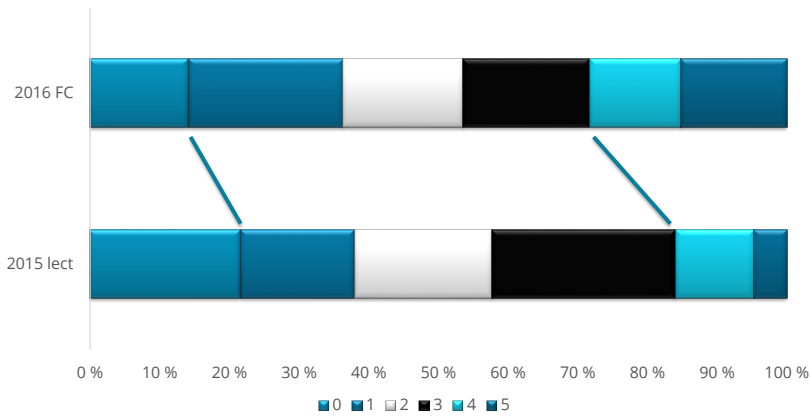
Concept Mapping Academy



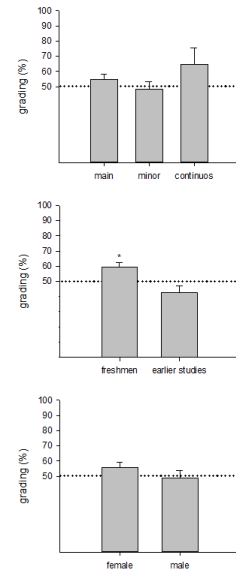
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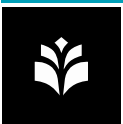
## Blended vs onsite course



### SUMMATIVE

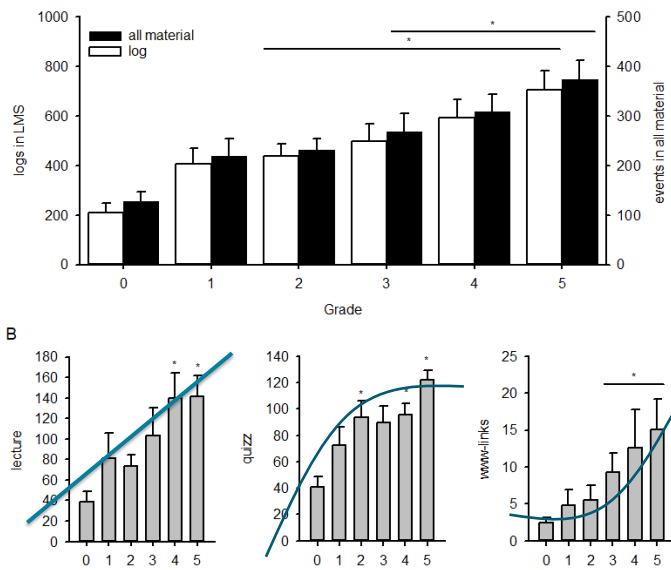


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## Summative: Resources, tasks

### SUMMATIVE



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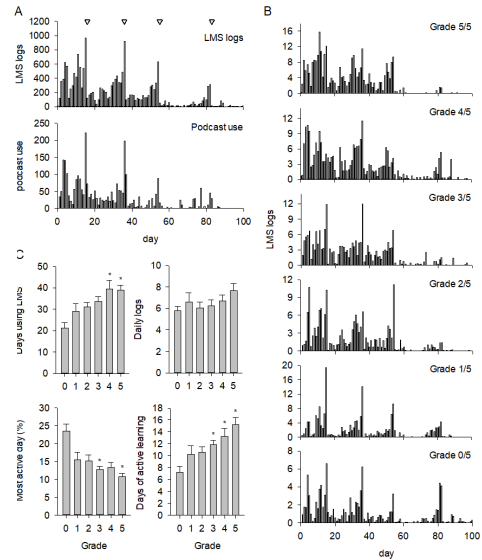
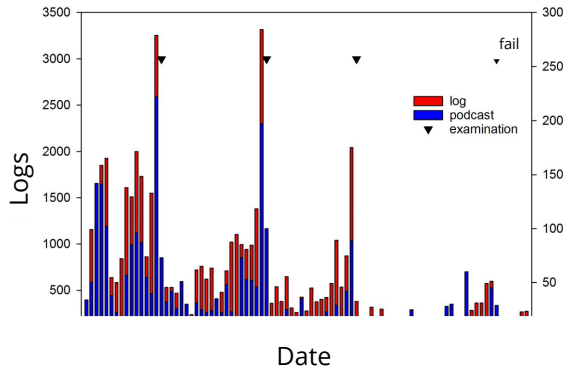


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# Procastination problem

SUMMATIVE

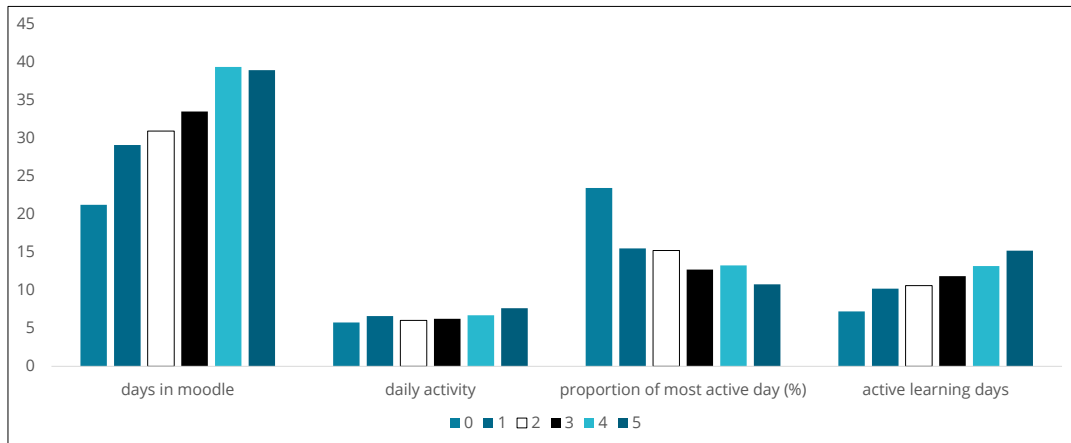


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# Time related challenges can be measured by many ways

SUMMATIVE



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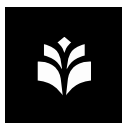
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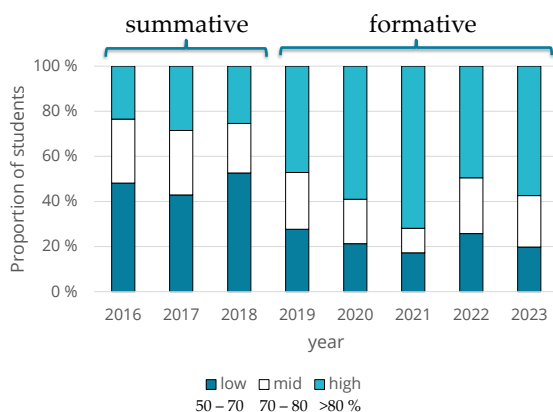


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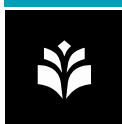
FORMATIVE

## Results: Assessments & pass-rate



- When the course has exam assignments 20 % of students get high grade
- Replacing the examinations with essays and feedback doubles the proportion of students reaching high scores in the course.
- In formatively assessed courses, students used 70 % more LMS and studied 3 times more (also the low score students) for which high scores are caused by harder study work.

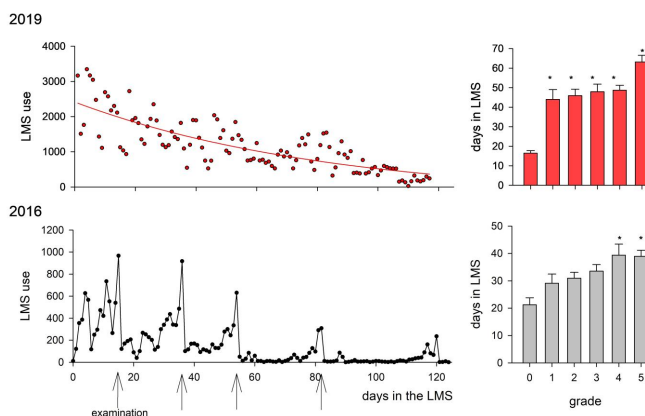
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## Assessments & LMS activity

- LMS activity is usually high on the night before the examination (bulimia pedagogy)
- When exams are removed, daily LMS activity becomes steadier, but there is a clear fade out of course activity
- In both cases students failing the course have less activity on the course



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# Writing as a learning process

5.8% of essays were resubmitted after comments & guidance

Started  
16/9 at 16:06  
edited  
3/10 at 16:03

"The  $\mu$ -opioid receptor consists of alpha helices, which are stabilized by hydrogen bonds inside the polypeptide chain."

edited  
4/10 at 20:10

"The corkscrew-like parts of the  $\mu$ -opioid receptor are alpha helices found in the secondary structures of proteins. Alpha helices consist of only one polypeptide chain, between which hydrogen bonds are formed between the NH and CO groups of every fourth amino acid, strengthening the helix structure. Each thread contains about 3.6 amino acids, which allows the alpha-helix to form a tight corkscrew-like thread. With hydrogen bonds, corkscrew-like structures hold together and are able to participate in protein functions in the body, such as accelerating chemical reactions and transporting substances."

edited  
4/10 at 20:16

"The corkscrew-like structures of the  $\mu$ -opioid receptor are alpha helices found in the secondary structures of proteins. Alpha helices consist of only one polypeptide chain, between which hydrogen bonds are formed between the NH and CO groups of every fourth amino acid, strengthening the structure of the helix. Each thread contains about 3.6 amino acids, which allows the alpha-helix to form a tight corkscrew-like thread. With hydrogen bonds, corkscrew-like structures hold together and are able to participate in protein functions in the body, such as accelerating chemical reactions and transporting substances."

edited  
5/10 at 17:07

"The corkscrew-like structures of the  $\mu$ -opioid receptor are alpha helices found in the secondary structures of proteins. Alpha helices consist of only one polypeptide chain, between which hydrogen bonds are formed between the NH and CO groups of every fourth amino acid, strengthening the structure of the helix. Each thread contains about 3.6 amino acids, which allows the alpha-helix to form a tight corkscrew-like thread. With hydrogen bonds, corkscrew-like structures hold together and are able to participate in protein functions in the body, such as accelerating chemical reactions and transporting substances."

edited  
6/10 at 18:57

"The corkscrew-like structures of the  $\mu$ -opioid receptor are called alpha helices. They occur only in the secondary structures of proteins. Alpha helices consist of only one polypeptide chain, between which weak interactions are formed: hydrogen bonds. The strength of a hydrogen bond is based on the ability of a very electronegative element to pull electrons away from a hydrogen atom and thus produce a positive partial charge for the hydrogen atom. In the alpha helix, hydrogen bonds are formed between the NH and CO groups of every fourth amino acid, strengthening the maintenance of the shape of the helix. The strength and number of hydrogen bonds can affect how tightly the protein stays in shape. The side chains of amino acids are directed outward from the axis of the thread, forming the outer edges of the thread. The side chains of the outer edges can be hydrophilic or hydrophobic. The orientation of the side chains outward is important because it affects how the protein can interact with other molecules. Hydrophobic side chains tend to hide inside, while hydrophilic ones tend to be directed outward in aqueous environments. Each alpha thread contains about 3.6 amino acids, which allows the alpha-helix to reach a corkscrew-like helix. With hydrogen bonds, corkscrew-like structures hold together and are able to participate in protein functions in the body, such as accelerating chemical reactions and transporting substances."

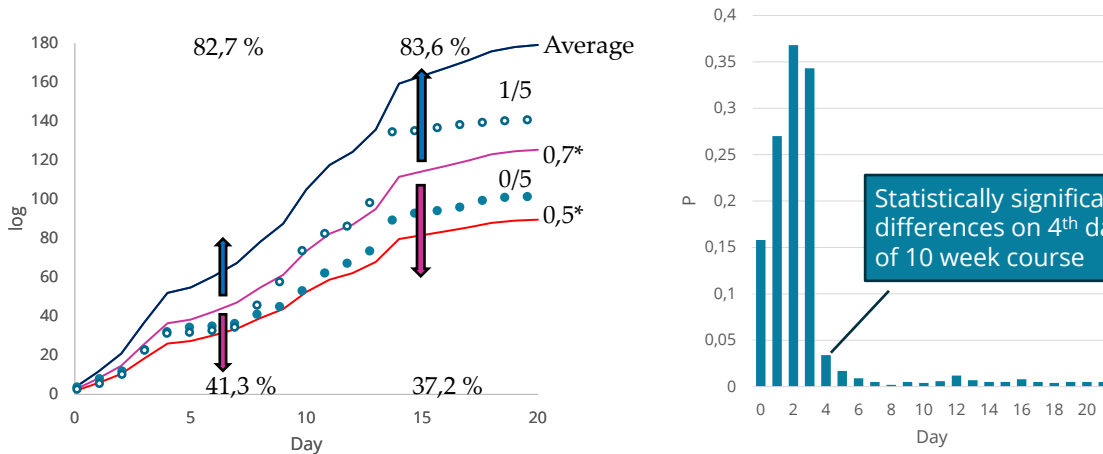
edited+submitted  
9/10 at 14:50

"The corkscrew-like structures of the  $\mu$ -opioid receptor are alpha helices. They occur only in the secondary structures of proteins. Alpha helices consist of only one polypeptide chain, between which weak interactions are formed: hydrogen bonds. Hydrogen bonds are formed when a truly electronegative element attracts electrons and creates a positive partial charge around the hydrogen atom. In the alpha helix, hydrogen bonds are formed between the NH and CO groups of every fourth amino acid, strengthening the maintenance of the shape of the helix. The strength and number of hydrogen bonds affect how tightly the protein holds its shape. The side chains of amino acids significantly affect the three-dimensional structure of the protein and its function. The side chains of the outer edges can be either hydrophilic or hydrophobic. Hydrophobic side chains tend to the inside, while hydrophilic ones tend outward. The orientation of the side chains outward is important because it determines how the protein can interact with other molecules. Each alpha thread has 3.6 amino acids, which allows it to achieve a tight corkscrew-like thread. With hydrogen bonds, corkscrew-like structures are held together and able to participate in protein functions in the body, such as acting as an enzyme and transporting substances."

Typically, submission happened 24.5 h after opening the assignment.



# Early activity



Statistically significant differences on 4<sup>th</sup> day of 10 week course

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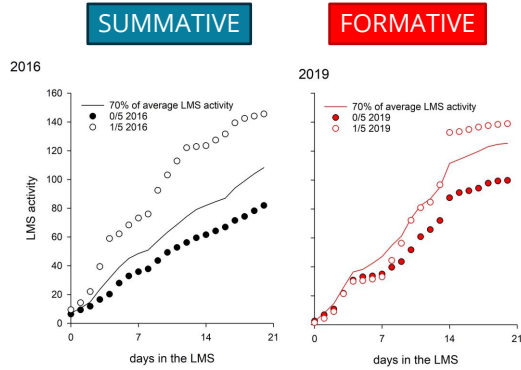


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# Lose the sight, lose the fight

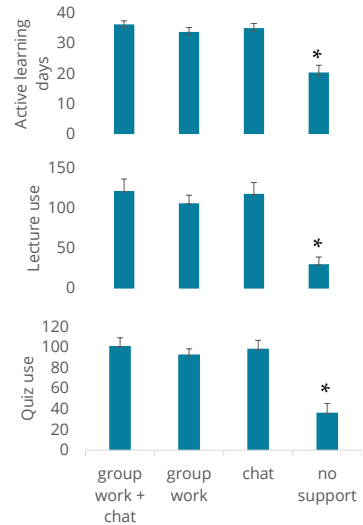
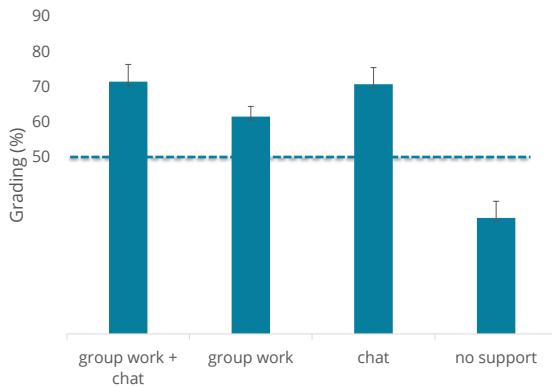
- Students failing the course have less LMS activity in the beginning of the course. This is independent of the ways of assessments
- Therefore, teacher can find the students with a high risk of dropout and help them to focus on the course. However, low-progress rate is never a determinative predictor of failing the course.



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# Supportive mechanisms



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## Annex 3. Programme of the second TTT workshop

# TTT SESSION 2 WORKSHOP AGENDA

- Location:** [Zoom](https://uef.zoom.us/j/64197059515?pwd=OeH0IW8WrEcUlgbsmzY1ZRSMurQwz.1) (https://uef.zoom.us/j/64197059515?pwd=OeH0IW8WrEcUlgbsmzY1ZRSMurQwz.1)
- Date:** 29.1.2024
- Time:** 15.00–17.15 (GMT +2)
- Participants** Science education and Teacher Education staff who are involved in module and micro-credencial development



### PRE-ASSIGNMENTS FOR THE TTT WORKSHOP

Fill in ideas for how to develop e-manual:

[E-manual Development](https://digicampus.fi/mod/board/view.php?id=368108) (https://digicampus.fi/mod/board/view.php?id=368108)

Add question about Moodle activities:

[Digicampus FAQ](https://digicampus.fi/mod/glossary/view.php?id=371444) (https://digicampus.fi/mod/glossary/view.php?id=371444)

Share your MCC Learning unit drafts:

[MCC learn unit draft](https://digicampus.fi/mod/forum/view.php?id=372210) (https://digicampus.fi/mod/forum/view.php?id=372210)

### SCHEDULE

15.00–15.05	Start of the Workshop
15.05–15.35	AI in Education - Professor Teemu Valtonen Practical insights on leveraging AI in education
15.35–15.45	Micro credentials – Subcourse implementation in Digicampus Moodle
15.45–16.15	Learning Unit Group Leaders: Best Practices in online (5 minutes each) Short presentations on asynchronous implementations of learning unit online materials
16.15–17.10	Learning Unit Working Groups Learning unit development towards sustainable micro-credentials
17.10–17.15	Session wrap up

## Annex 4. Keynote slides of the Second TTT workshop



AI and learning

### Acastemy Train the Trainers

Does ChatGPT  
enhance students  
learning ?

Notably, the review suggests that ChatGPT can potentially improve academic performance, as evidenced by the overall large, positive effect. Simultaneously, it highlights the need for caution in interpreting these results owing to limitations in methodological approaches and assessment concerns.

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2024). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers & Education*, 105224.



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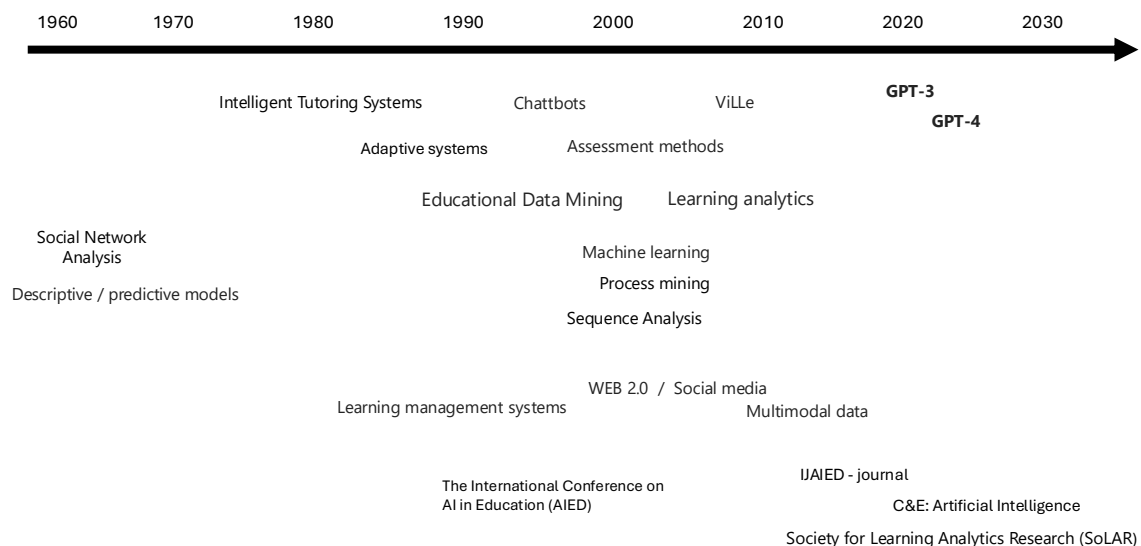
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## Which direction are we heading?

Back in the 1960s, as researchers were beginning to explore how computers might be used in education, there were two primary schools of thought. One focused on **using computers to efficiently and effectively deliver instruction** to the learner. The other focused on providing learners with opportunities to **use technologies to create, experiment, and collaborate** on personally meaningful projects. Seymour Papert referred to these two different approaches as **instructionist** and **constructionist**.

Resnick, M. (2023). AI and creative learning: Concerns, opportunities, and choices. Medium.  
<https://mres.medium.com/ai-and-creative-learning-concerns-opportunities-and-choices-63b27f16d4d0>

## AI and learning analytics from the perspective of teaching and learning



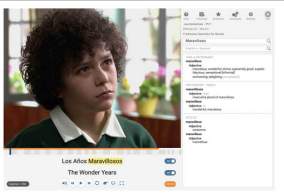
## Typical AI applications before 2020 – Intelligent Tutoring Systems

### Our Expert Math Tutors Deliver **Guaranteed Results & Boost Math Confidence**

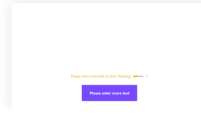
No matter if your child is behind, at grade level, or ahead, improve math scores by 90% in 6 months with a human tutor super-powered by AI.



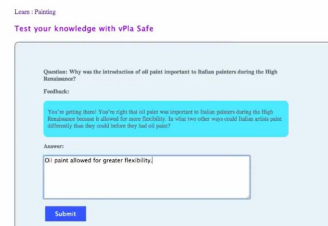
### Yabla's Smart Subtitle Technology Helps You Learn Faster



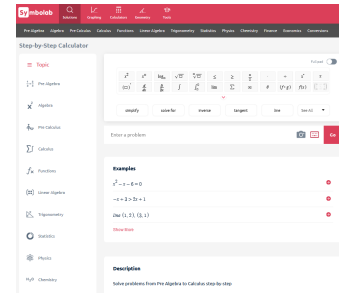
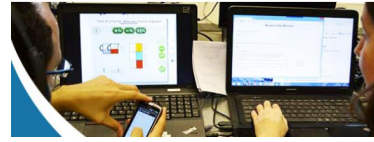
### #1 Plagiarism Detection & Resources for Academic Writing



### vPIA - virtual personal learning assistant



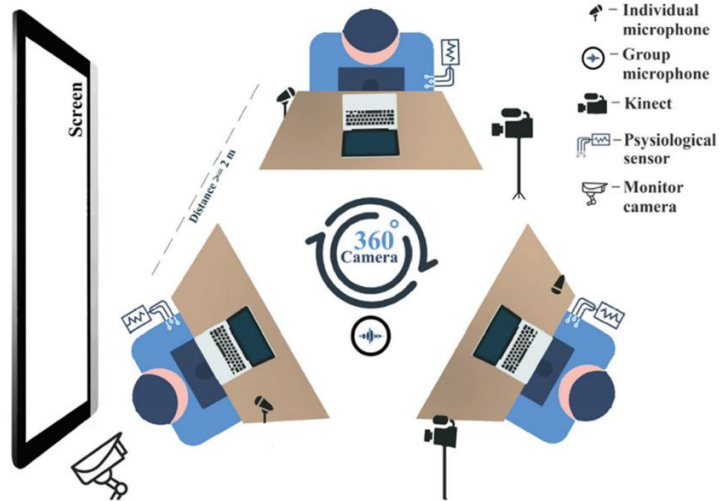
### Talk, Tutor, Explore, Learn: Intelligent Tutoring and Exploration for Robust Learning



Chen, X., Xie, H., & Hwang, G. J. (2020). A multi-perspective study on artificial intelligence in education: Grants, conferences, journals, software tools, institutions, and researchers. *Computers and Education: Artificial Intelligence*, 1, 100005.

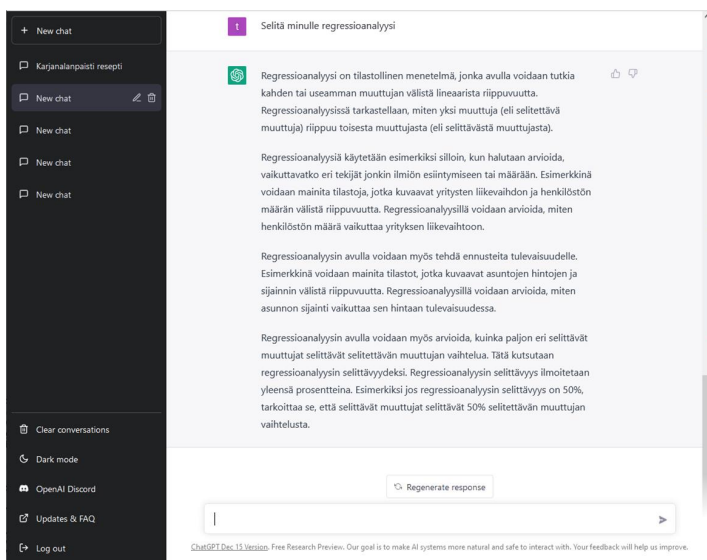
## Ideas for the future...

Järvelä, S., Nguyen, A., & Hadwin, A. (2023). Human and artificial intelligence collaboration for socially shared regulation in learning. *British Journal of Educational Technology*, 54(5), 1057-1076.



# Large language models

## Basic - ChatGPT



Using natural language.

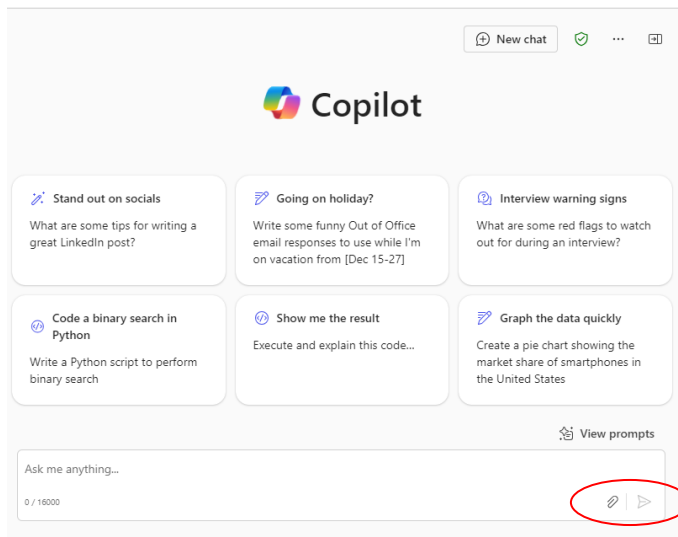
Illusion of skilled use of AI.

Universal intelligence.

Hallucinating.

Provides ready-made answers and solutions.

## Towards more adaptive AI - Copilot

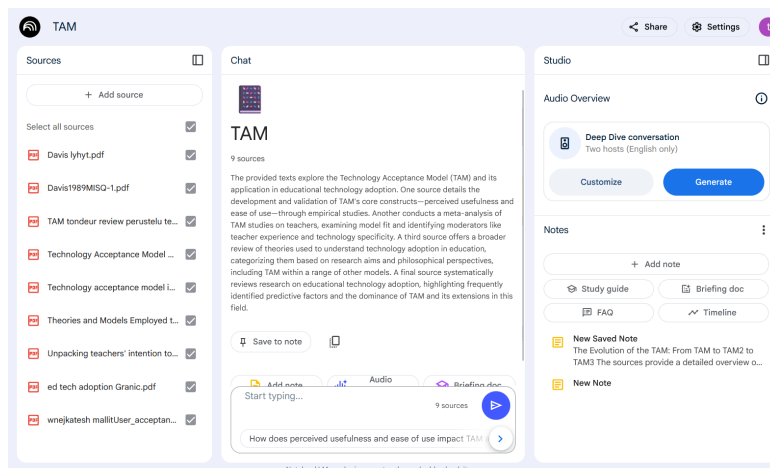


Possibility to bring your own material for discussion.

Combines with other generative AI tools.

Provides reference links.

## Towards AI agents – NotebookLM

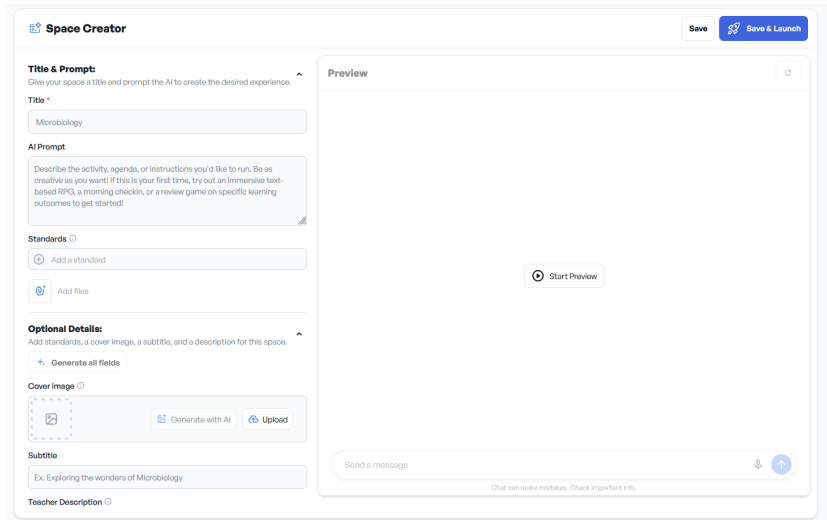


Possibility to bring your own various types of material collections as a basis for working.

Provides ready-made tools for processing the material.

Provide references to the source materials used.

## AI agents – Space Creator



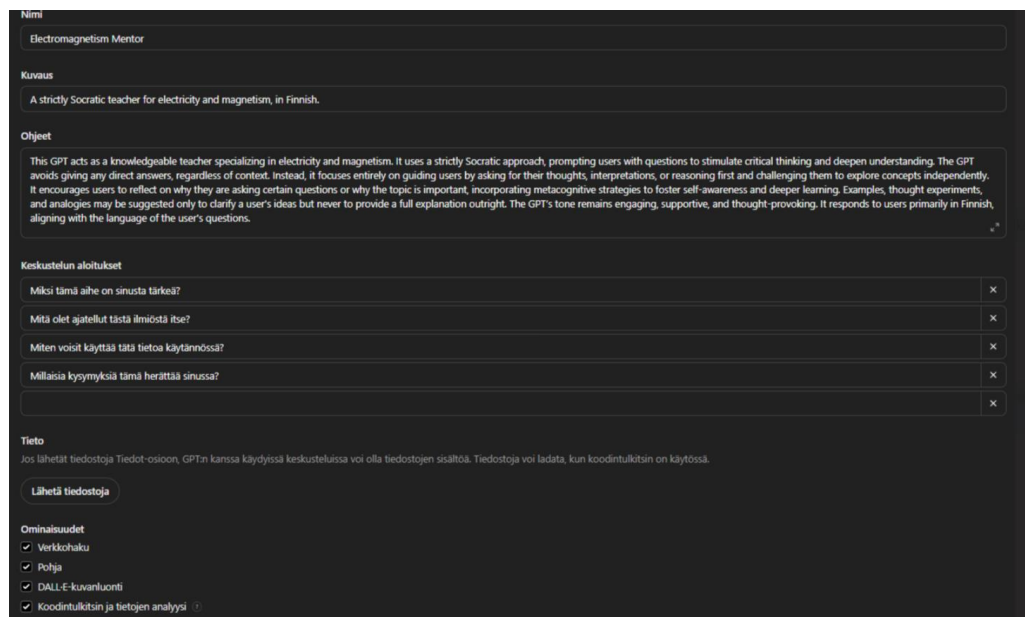
Intelligent tutoring systems?

Interaction is based on selected source materials.

The format and interaction of AI responses can be influenced.

Pedagogy for AI?

## ChatGPT 4 agent *trained* by Jori Manner





Example agent in practise.

For personalized support

For supporting collaborative learning

**Esikatselu**

Kävimme luennolla tänään esimerkin, jossa hankaamalla varattu lasisauva vietiin langassa roikkuvan pingispallon viereen. Pingispallo kääntyi kohti lasisauvaa. Miksi näin tapahtui?

Mielenkiintoinen havainto! Mietitänpä yhdessä. Mitä luulet, mitä lasisauvan varauksesta tapahtui, kun sitä hangaattiin? Miten tämä varaus voisi vaikuttaa pingispalloon? Voisitko myös pohtia, onko pingispallo itsessään varattu vai neutraali alussa? Mitä mahdollisesti tapahtuu pingispallon sisällä, kun lasisauva tuodaan sen lähelle?

Hangatessa lasisauva se varautuu. Pingispallo taas ei ole varattu. Luulen, että lasisauva varaa pingispallon.

Hyvä huomio! Lasisauva todella varautuu hankaamalla, ja pingispallo alkaa vuorovaikuttaa sen kanssa, vaikka se itsessään ei ole varattu alussa. Mutta mitä tarkalleen tarkoitat sillä, että lasisauva "varaa" pingispallon? Voisitko pohtia, tapahtuuko pingispallossa jokin sisäinen uudelleenjärjestely, kun se vietiin lähelle lasisauvaa? Entä miten tämä voisi selittää sen, että pingispallo kääntyy kohti saavaa?

Varauksia siirtyy pingispalloon.

Hieno ajatus, mutta pysähdytään hetkeksi tarkentamaan: siirtyivätkö varaukset pingispalloon vai voisiko kyse olla jostain muusta? Pingispallo ei alusta neutraali, eikö siinä ole yhtä paljon positiivisia ja negatiivisia varauksia. Mitä luulet, voisitko nämä varaukset pingispallon sisällä liikkua tai järjestäytyä uudelleen, kun lasisauva tuodaan lähelle? Jos varaukset järjestäytyvät uudelleen, mitä se tarkoittaisi niiden keskinäiselle vuorovaikutukselle lasisauvan kanssa?

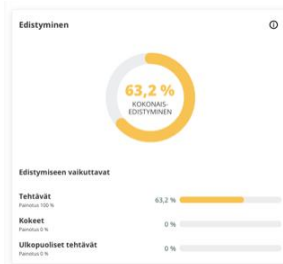
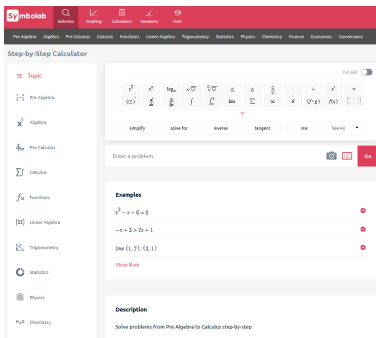
Ei lasisauva vetää puoleensa pingispallon erimerkkisiä varauksia ja hyökkäi samanmerkkisiä varauksia. Jolloin lasisauvan ja pingispallon välillä on sähköinen vuorovaikutus.

Juuri niint Olet päässyt tärkeän ilmiön ytimeen. Kun lasisauva tuodaan lähelle pingispalloa, lasisauvan varaus aiheuttaa varausjakauman pingispallon sisällä. Toisin sanoen, pingispallon erimerkkiset varaukset siirtyvät lähemmäksi saavaa, kun taas samanmerkkiset varaukset siirtyvät kauemmas. Tätä ilmiötä kutsutaan induktioksi.

Nyt kun olet hahmottanut vuorovaikutuksen perusperiaatteen, mietitään tätä: miksi pingispallo lopulta liikkuu kohti lasisauvaa, vaikka samanmerkkiset varaukset hylkivät toisiaan? Mitä voisit päätellä voimien suuruuksista näiden varauksien välillä?

### Intelligent Tutoring Systems (ITS):

- Strong emphasis on contents
- Personalized learning paths
- Analytic dashboards

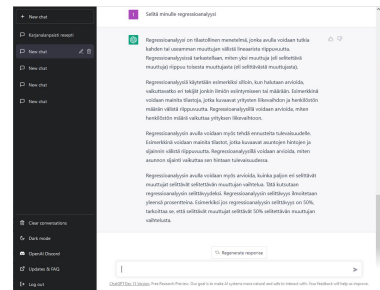


### Learning analytics:

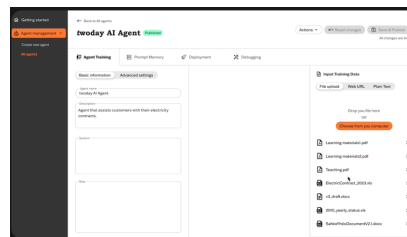
- Visualizing and understanding the learning process
- Predicting students' learning performance

### Large language models:

- Universal machine
- All content areas with a hallucinatory approach



AI for supporting learning



### AI agents

- Large language model 'restricted' to specific content
- Interaction is guided
- Analytics



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## Prompting - forming questions and interpreting answers:

Posing questions help/force the learner/group of learners to structure and integrate new information based on their existing knowledge and understanding.

A question verbalizes and possible re-structures one's current understanding into a comprehensible form.

Questions require follow-up questions.

An answer often requires reflection – especially when AI may hallucinate.

Reflection alone and together.

## AI as personal support:

Students' self-efficacy affects their ways of learning along with their ways and courage to ask for help.

Low self-efficacy can be a barrier to asking for help during classes.

Fear of failure.

AI as individual support.

Easier to ask for help – clarifying perspectives – additional explanations.

No fear of embarrassing oneself.

Target for learning situation

### Hybrid intelligence:

“A combination of human and machine intelligence that complements human intelligence and abilities rather than replacing them. It is a combination that achieves goals that neither humans nor machines could achieve separately.”

Akata, Z., Balliet, D., De Rijke, M., Dignum, F., Dignum, V., Eiben, G., ... & Welling, M. (2020). A research agenda for hybrid intelligence: augmenting human intellect with collaborative, adaptive, responsible, and explainable artificial intelligence. *Computer*, 53(8), 18-28.



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