Managing Affective-learning THrough Intelligent atoms and Smart InteractionS

D9.2 Report on Industrial Training pilots

Workpackage	WP9 – Pilots in Industrial Training and Career Guidance
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Abstract:	This deliverable reports on the preparation, execution and evaluation of the MaTHiSiS Industrial Training Case assisted pilot.

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0.1	12/12/2017	Julien Dubois (AV), Hanna-Kaisa Saari (AV), Renaud Delahey (IDGEO), Thomas Techene (DXT)	Submission for the first internal review
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0.5	20/12/2017	Ana Piñuela (ATOS)	Final quality review
1.0	20/12/2017		FINAL VERSION TO BE SUBMITTED

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List of Acronyms

Abbreviation / acronym	Description
AV	Aerospace Valley
CGDLC	Career Guidance Distance Learning Case
D	Deliverable
DXT	Diginext
High definition	HD
ID	Intellectual Disability
ITC	Industrial Training Case
KPI	Key Performance Indicator
LA	Learning Action
LM	Learning Material
LG	Learning Goal
M	Month
PA	Platform Agent
PC	Personal Computer
SC	Sensorial Component
SLA	Smart Learning Atom
SME	Small and Medium Enterprise
WP	Work Package

Table 1: Definitions, Acronyms and Abbreviations

Project Description

The MaTHiSiS learning vision is to provide a novel advanced digital ecosystem for vocational training, and special needs and mainstream education for individuals with an intellectual disability (ID), autism and neuro-typical learners in school-based and adult education learning contexts. This ecosystem consists of an integrated platform, along with a set of re-usable learning components with capabilities for: i) adaptive learning, ii) automatic feedback, iii) automatic assessment of learners' progress and behavioural state, iv) affective learning, and v) game-based learning.

In addition to a learning ecosystem capable of responding to a learner's affective state, the MaTHiSiS project will introduce a novel approach to structuring the Learning Objectives for each learner. Learning graphs act as a novel educational structural tool. The building materials of these graphs are drawn from a set of Smart Learning Atoms (SLAs) and a set of specific Learning Objectives that will constitute the vertices of these graphs, while relations between SLAs and Learning Objectives constitute the edges of the graphs. SLAs are atomic and complete pieces of knowledge [1] that can be learned and assessed in a single, short-term iteration, targeting certain problems. More than one SLA, working together on the same graph, will enable individuals to reach their learning and training goals. Learning Objectives and SLAs will be scoped in collaboration with learners themselves, teachers and trainers in formal and non-formal education contexts (general education, vocational training, lifelong training and specific skills learning).

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Executive Summary

This deliverable reports the assisted pilot phase of the MaTHiSiS Industrial Training Case (ITC). During this phase, the pilot that validates the MaTHiSiS Platform at the pilot premises with the different stakeholders, run under the total supervision of the MaTHiSiS consortium.

The pilot in industrial training has been carried out by Aerospace Valley (AV) with the technical support of Diginext (DXT). The stakeholder selected for the validation is IDGEO, a specialized professional training company that trains employees (18-65 years old) from different companies in the use of space data for the development of new products and services.

The preparation activities of the assisted pilot include the:

- Validation of the training programme: use of Terrahub platform.
- Selection of the tutors and learners that will participate in the pilot: 1 tutor from IDGEO and 15 learners from 15 different companies (23-51 age)
- Selection of the MaTHiSiS Platform agents to be used: a Kinect 2 sensor with a specific Laptop (CORE i7, Windows 10) and 9 HD webcams.
- Identification of the venue and planning of the scenario: The assisted pilot takes place in two different phases 1) Pre-training phase in the IDGEO classroom PA; 2) Physical training phase in the IDGEO classroom.
- Design and development of the learning experience process, with its learning goals (LG) and learning materials (LM).
- Tutor training
- Testing phase

The pilot that trains the learners in the use of TerraHub platform was executed in two sessions during November 22, 2017:

- Session 1: 8 PCs with HD webcam in IDGEO training room (1 team session of 8 people)
- Session 2: 6 PCs with HD webcam and 1 laptop with HD webcam in IDGEO training room (1 team session of 7 people)

Each session was composed of two sub-phases:

- Remote individual pre-training sub-phase
- Physical team training sub-phase

The evaluation activities were conducted in parallel with the assisted pilots' sessions. The evaluation approach is based on the framework defined in "D2.5 Evaluation Strategy" [2]. The MaTHiSiS Platform was successfully demonstrated in both sessions by the tutor and learners, with minor technical and organisational problems. The pedagogical objective of the ITC training, which was the use of TerraHub platform in order to develop services and products using space and geomatic data, was reached.

1. Introduction

The main objective of this deliverable is to explain the preparation, execution and the evaluation of the Industrial Training Case Assisted Pilot.

This document is divided into the following sections:

1. Introduction of the document
2. Description of the ITC
3. Identification of the pilot phases
4. Description of the preparation phase with the selection and engagement of the stakeholder and the training programme and the creation of the related Learning Goals (LG), Smart Learning Atoms (SLA) and Learning Materials (LM)
5. Description of the ITC Assisted Pilot execution
6. Description and results of the ITC Assisted Pilot evaluation
7. Conclusions including recommendations for the Real-life Pilot phase

2. Industrial Training Case

2.1 Brief Description of ITC

In the industrial training case, all types of learners will be addressed, although most of them will be adults aged 18-65, industrial workers without major disabilities or learning impairments, thus mirroring the overall industrial European workforce as it stands today. Learners will be trained to use TerraHub, a tool aiming at collecting, processing, and using space and geomatic data. Geomatic is a discipline of gathering, storing, processing and delivering geographic information or spatially referenced information. TerraHUB is based on an existing off-the-shelf open source software called geOrchestra enriched with specific modules. The basic features provided by the platform are the following:

- Manage data and metadata from several external sources (storage, backup, updating)
- Ingest and publish data and metadata thanks to harvesting operations, visualization and extraction tools.
- Process services thanks to the OGC-WPS feature and based on data stored on the Spatial Data Infrastructure server (raster or vector data).
- Manage security and access rights by assigning rights to users or groups of users.

The objective of the training is to allow learners to use such a platform in order to develop services and products using space and geomatic data.

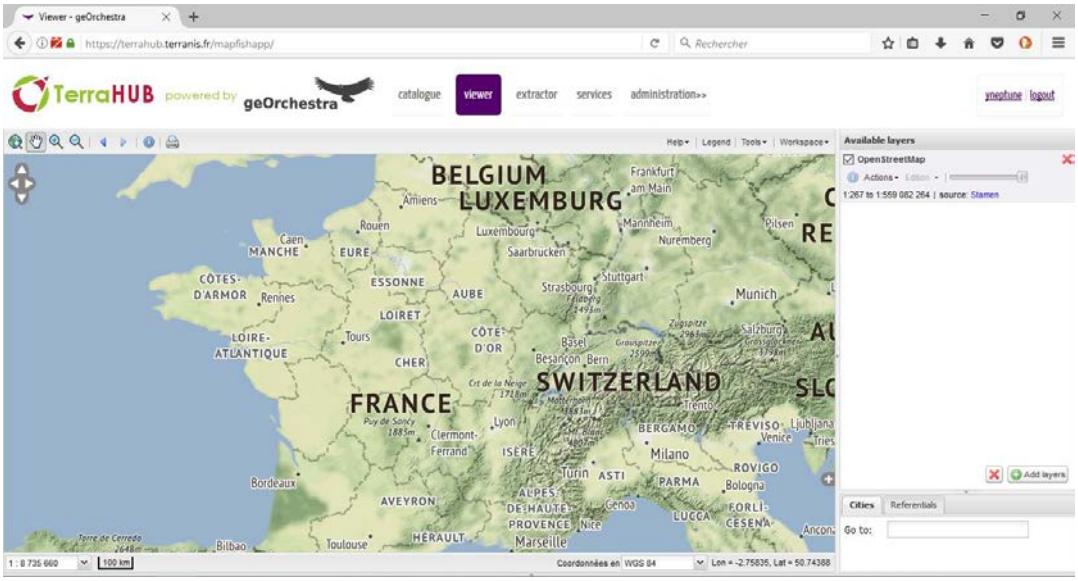


Figure 1: TerraHub Web based platform

2.2 Associated challenges and roles

The industrial training case trainers are expecting to get into training by using new innovative solutions based on new technologies and more specifically on adaptive learning and personalized pedagogy. The existence of such a solution is still limited. MaTHiSiS shall bring a great benefit for trainers and their learning experience in terms of user friendliness and attractiveness of the training materials and contents and in terms also of adaptation of learning process to their knowledge and progress level in order to stimulate the motivation of learners and keep them engaged in the learning process.

3. MaTHiSiS Pilot phases

MaTHiSiS project implements a three step approach for the deployment of the pilots in three conceptually different and consecutive phases for each use case, introduced by a user and system requirements elicitation phase:

- Driver Pilots, which ran in June 2017: This pilot ran under the total supervision from the MaTHiSiS consortium. People at the venue setup and configured the system under MaTHiSiS consortium guidance following a training.
- Assisted Pilots that Assisted Pilots initiated the procedure in July 2017 and ran with the users in November 2017 with the assistance of the MaTHiSiS consortium. Based on the evaluation results of the Driver Pilots, and leading to the refinement of component and system level technology consolidation, an enhanced version of the MaTHiSiS platform has been tested during this phase. This deliverable reports the preparation, execution and evaluation of the Assisted Pilots phase.
- Real-life Pilots in the third year of the project (2018): final tests will occur approaching the end of this phase. This pilot will run autonomously by people at the venue.

4. ICT Pilot Preparation Activities

4.1 Stakeholders and training programme selection

For the ICT assisted pilot, a new stakeholders and training programme selection was not conducted totally. IDGEO, the selected driver pilot company, notified us their willingness to contribute again and participate to the testing of MaTHiSiS solution. The training programme was based on the same training procedure developed for the driver pilot with some improvements according to driver pilot recommendations. The description of the stakeholders and training programme selection is deeper detailed in the D9.1 [3].

4.2 User and system requirement elicitation phase

The user requirements analysis made with IDGEO has allowed the identification of a group of target learners as adults aged 18-65 working in the industrial sector and more generally participating in the European workforce (D2.2 [4]). Most of them are non-diagnosed adults. One of the main aspect is the importance of providing new training solutions, using IT to bring added-value to existing training methods without replacing trainers and without requiring additional effort, so that training is in turn more interactive, attractive and efficient.

Regarding the technical aspect of the user requirements, IDGEO was interested in working with their own content, partly developed and digitalized, and therefore they required the platform to be able to reuse content in existing formats (.ppt, .pdf, .mp4, etc.). Compatibility of the platform with a large variety of brands of platform agents and with already established LMs is as a key advantage.

The physical environment in which the pilot is organized at IDGEO will rather be a classical one: 'in-class' training paired up with 'remote training sessions' and 'out of training session modules' using PCs, laptops or mobiles. The possibility to organize remote sessions and to develop pedagogical modules to be used on personal devices out of the training session has also been emphasized.

4.3 Development of Learning goals, Smart Learning Atoms, Learning Materials

Based on the driver pilot evaluation, recommendations were done to adapt the LGs and SLAs. The main recommendation was about a too much sequential approach of the driver pilot LG which does not match with the learner oriented approach promoted by MaTHiSiS. It was also encourage to increase gamification in the ITC. In order to integrate these modifications the LGs was re-shaped. The drive pilot LG0 and LG1 were merged to be only one LG (LG1) and the driver pilot LG2, LG3, LG4 and LG5 were merged to be only one LG also (LG2). Previous LGs were transposed into SLA which allow a random progress. This new configuration broke the linearity and the learners had not the same content at the same moment. To integrate gamification, a quiz approach was used, each SLA was validated by a quiz and three levels of difficulty were created. The quizzes were created by IDGEO trainers who also created learning graphs and the Smart Leaning. All the LGs, SLAs and LMs are described in the table below.

Learning Goal (LG)	Smart Learning Atom (SLA)	Weight	Learning Action (LA)	Learning Materials (LM)	Platform Agent (PA)
LG1: Pre-requisites Terrahub	GIS data first level knowledge skills	0,7	GIS data first level knowledge skills	1. PDF document	Laptop + 8 PCs
				2. Quiz	
	Understanding what the training is about	0,5	Understanding what the training is about	1. You Tube Video	
				2. Quiz	
LG2: Handling Terrahub	Geo-data sets search	0,7	Terrahub search	1. Terrahub Catalog	Laptop + 8 PCs
			Web data search	2. Quiz	
	Viewer Handling	0,5	Visualise and manipulate of data	1. Terrahub Viewer	
				2. Quiz	
	TerraLOADER Handling	0,3	Import data	1. TerraLOADER	
				2. Quiz	
	Exploit Terrahub Datasets	0,4	Make the web services publication	1. Terrahub/QGIS	
				2. Quiz	

Table 2: ITC Assisted Pilot LG, SLA and LM

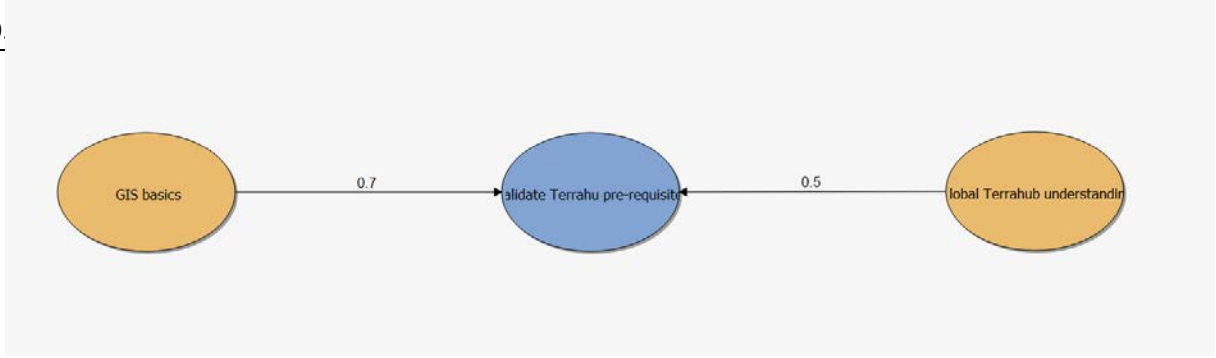


Figure 3: LG1 of the ICT assisted pilot

4.4 Platform agents and physical settings for the Assisted Pilot

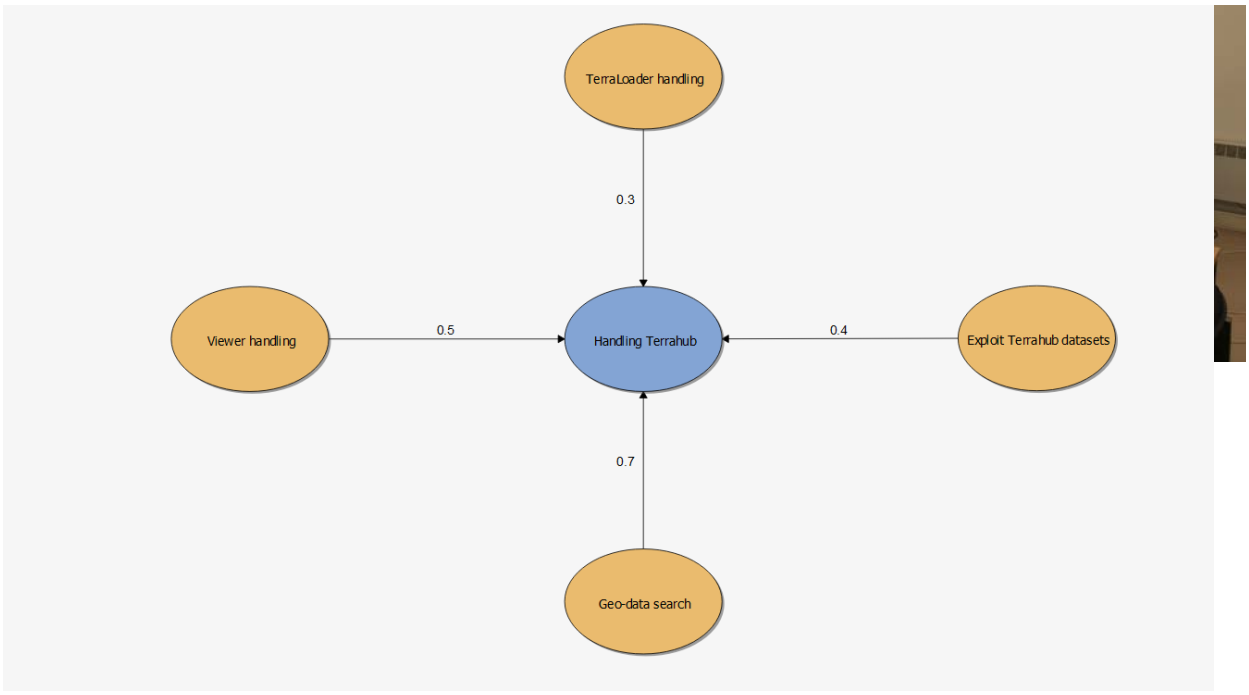


Figure 2: LG2 of the ICT assisted pilot

The PAs that were selected to be used in the ITC Assisted Pilot were the same as in the driver pilot. It's composed of a Kinect 2 sensor with a specific Laptop (CORE i7, Windows 10) and 8 HD webcams. The system was launched and executed simultaneously by learners.

The assisted pilot physical setting was a common French classroom environment (see Figure 4). Trainees were dispatched on three table lines. On a same line three trainees were side by side in front of a PC/laptop and a webcam/Kinect 2.

Trainees faced the trainer who displayed support content to all.

4.5 Assisted Pilot scenario and planning

During the first pilot phase, the ITC was divided in three separated sub phases:

1. **Remote individual training sub-phase;**
2. **Physical individual training sub-phase;**
3. **Physical team training sub-phase.**

Following the driver pilot recommendations, the assisted pilot was planned into two sub-phases:

1. **Remote individual pre-training sub-phase**: aims at guarantying, before entering the main training, that the learners have the required knowledge level for the training and that the leaners understand the content of the training they will follow. This phase is executed with LG1 and is ideally done remotely by each learner whenever, wherever is convenient for him using the platform agent PC, laptop or Mobile Phone.
2. **Physical team training sub-phase:** with the evolution of the LG of the ITC the sub-phase 2 and the sub-phase 3 of the Driver Pilot were merged in one physical team training sub-phase. It aims at training the learners about the basic information of the TerraHub platform, as well as to search, visualize, manipulate and import/export Geodata and how to publish geoformation based web services with the manipulated data. This phase is executed with the LG2 and corresponds to the classical TerraHub training settings.

It was initially planned the ITC assisted pilot would be organized on three days:

- 20th of November 2017: Remote individual training sub-phase
- 21st of November2017: First Physical team training session with nine trainees during half of the day.
- 22nd of November 2017: Second Physical team training session with nine other trainees during half of the day.

However during test phase, we faced technical problems that delayed the planning. Therefore the assisted pilots were compressed in a one day pilot the 22nd of November 2017. The technical problems are described in the section 4.7 Tutor training and Test phase.

Additionally, three trainees refused 3 weeks before the assisted pilots to participate because of the collection of personal data. They feared these data would be used later for another purpose.

4.6 Setting of the venues

The sessions have been organized in the following locations:

1. **Remote individual pre-training phase** was organized in IDGEO premises instead of remotely by the learners themselves. During the preapartory activities, it was realized between ICT partners (AV, DXT and IDGEO) that the actual installation and launching process were not possible at this stage to be performed by non trained people to execute the MaTHiSiS platform in autonomous event with a user guide. The main barrier was the setting of the two clients: the sensorial component (SC) client and the platform agent (PA) client before the connection to the MaTHiSiS platform. This problem will be detailed in the section 6.3 Improvements to be made for the Real-life Pilot. This sub-phase was performed before the physical team training phase. In the morning session, eight PCs with the HD webcam and wired internet connection were used. In the afternoon session, six PCs and one laptop with the HD webcam and wired internet connection were used. The Kinect 2 was not used because of technical problem.
2. **Physical team training phase** was also organized in the same IDGEO classroom just after sub-phase 1 with the same setting as in sub-phase 1.

4.7 Tutor training and Test phase

Before the Assisted pilot, two half day local meetings and two full day remote meetings were organized with the technical partner (DXT) and the pilot partners (AV, IDGEO) to prepare the pilot. These meetings were dedicated to the improvement of the LG, the creation of the LM, the training and the testing.

The tutor was trained by the technical partner (DXT) in the use of the MaTHiSiS Platform: installation of the clients, setting of the clients, launching of training and monitoring sessions. In the contrast with the Driver Pilot, the tutor was also trained to the Learning content editor in order to create the

learning graphs and the Smart Learning Atoms. Only the integration of the LM in the SLA was not done by the tutor as no interface was accessible for him. This part was done by the technical partner in charge of that. This part had slow down the test phase and revealed an evolution for the real-life pilot. The improvement will be deal in the section 6.3 Improvements to be made for the Real-life Pilot

During the test phase we faced technical problems that delayed the test for all the LM and therefore impacted the initial planning

- After the launching, the SC and the PA clients could not communicate with the MaTHiSiS platform. It was identified that the problem came from firewall protection. The solution of the problem was to modify the setting of the Windows firewall access to specific external server and if necessary the organization firewall access to the same server. This technical requirement will be discussed in the 6.3 Improvements to be made for the Real-life Pilot.
- During the LM test we noticed that the quiz already created during the Driver Pilot could not worked with the latest update of MaTHiSiS. We had to recreate all these quizzes with the latest template file and sent them to the technical partners since the ICT partners had not access to integrate them in the platform.

After these problems solved, we were able to test all the SLAs and LMs.

5. ITC Assisted Pilot deployment and execution

This section explains in detail the ITC Assisted Pilot deployment and execution.

5.1 MaTHiSiS project pilots phases

MaTHiSiS project implements a three step approach for the deployment of the pilots in three conceptually different and consecutive phases for each use case, introduced by the user and system requirements elicitation phase:

1. Driver Pilots, which ran in June 2017: This pilot ran with assistance from the MaTHiSiS consortium. People at the venue setup and configured the system under MaTHiSiS consortium guidance following a training.
2. Assisted Pilots that run in November 2017: based on the evaluation results of Driver Pilot outcome, leading to the refinement of components and system level technology consolidation, an enhanced version of the MaTHiSiS platform will be tested during this phase.
3. Real-life Pilots in the third year of the project (2018): final tests will take place when approaching the end of this phase. These pilots will run autonomously by people at the venue.

5.2 ITC Assisted Pilot fact sheet

Below is presented a summary factsheet of the ITC Assisted Pilot execution.

Organisation Name	AV, IDGEO, DXT
Period of the sessions	22nd of November
Number of sessions	Morning session: team session of 8 people Afternoon session: team session of 7 people
Description of physical environment	Session 1: 8 Pcs with HD webcam in IDEGO training room (1 team session) Session 2: 6 Pcs with HD webcam and 1 laptop with HD webcam in IDEGO training room (1 team session)
Description of social environment	15 working adults aged between 23 and 51 from 15 different companies were trained to use the TerraHub platform.
Description of learning environment	French City, IDGEO classroom
Teachers involved (number and subjects)	1 trainer from IDGEO
Learners involved (number, age, peculiar condition, diagnosis or educational needs)	15 learners, 23-51 age, without disabilities or learning problems, different level of skills in GIS applications.
Number of LG created	2
Number of SLA created	6
Number of LM created	20

Table 3: ITC Driver Pilot Fact Sheet

5.2.1 User account creation and protection of personal information

For each learner, a specific pseudo name was created to protect his personnel data. This pseudo name was used to create the user accounts in the MaTHiSiS Platform. All 15 learners were informed about the pilot experimentation and its research aspects and asked to sign specific consents form before entering the training.

5.2.2 First session

The first session took place in IDGEO training room during the morning of the 22nd of November between 9:00am and 12:30am. IDGEO and AV had installed the required devices into the training venue. The learners were all located in the room as described in the section 4.3 Platform agents and physical settings for the Assisted Pilot. Following the trainer instructions all the trainees correctly set up the sensorial component client and the platform agent client. Minor improvements during the launching of the SC client were notified by learners as described in the section 6.3 Improvements to be made for the Real-life Pilot. The trainees could not launch the session from their accounts, they used the trainer account to do it. The problem may come from the setting of the trainee accounts. After this step all the learners started with the pre-training sub-phase. They were able to execute the LG1 and went through the different LMs without any issue. At contrary to the Driver Pilot the LMs were directly integrated into the MaTHiSiS platform and worked correctly. When trainees finished the LG1, they passed to the LG1.Same problem as in LG1 occurred in the launching. After resolving the launching issue, the trainees performed the different SLAs and validated them by answering a quiz. The progress within the different SLAs seemed to work properly. Trainees were able to go through the different levels but when they reached the level 3 on all the SLAs, the LG did not stop, it started all the level 3 SLAs constantly. We had to stop the session manually. Also, it was reported that a quiz could be passed without choosing an answer. Besides these small issues the pedagogical objectives of the formation were reached. For this session, the video recording was successfully launched.

5.2.3 Second session

The second session took place in the same training room during the afternoon of the 22nd of November between 2:00pm and 5:30pm. Between the two sessions an adaptation of the room configuration was done to install the Kinect 2 station. However the Kinect 2 wasn't recognized by the laptop despite the installation of the driver and it was replaced by an HD webcam to not delay the session. The session 2 followed the same sub-phase as the session 1. The same launching problem happened in the second session for both LGs. LG1 was correctly performed. For this session, trainees had also the problem of never-ending SLAs. In the middle of the LG1, a trainee reported their SLAs constantly stayed to level 1 at contrary of others. The problem was caused due to the webcam, since it captured a black screen so MaTHiSiS solution could not recognize the user's facial expressions. The trainer had to reboot the computer and launch again the SC and the PA clients during the session. Besides these small issues the pedagogical objectives of the formation were reached. We noticed afterward that the recording did not work for the second session. It worked only for the trainee who had the problem with the webcam after the reboot. The only difference between the two sessions was for first session there were no SC or PA data on the computer. We though that the problem could come from the setting of the PA by the trainer and trainees.

6. ITC Assisted Pilot Evaluation

The objective of the evaluation of ITC Assited Pilot was to assess the platform functionalities, and provide recommendations for the improvement of the MaTHiSiS platform and the execution of the real-life pilot phase.

6.1 Surveys

The evaluation processes defined in the D2.5 were translated into a web based questionnaire survey by https://www.qualtrics.com/. Three different surveys were created:

- two for the tutor:
  - General use of MaTHiSiS: https://ntupsychology.eu.qualtrics.com/jfe/form/SV_0ktavNR3gh613Rb
  - Focus on the platform agent: http://bit.ly/PlatformAgents
- one for the learners: https://ntupsychology.eu.qualtrics.com/jfe/form/SV_0dZ7gTk79FdHTb7

The focus on the platform agent will not be presented in this deliverable as it was presented in WP6.

The questions prepared in the D2.5 for the Assisted Pilot were adapted to the ITC. However the tutor evaluation could be misleading as only one tutor was involved in ITC.

In total one tutor from IDGEO and 15 learners answered to the survey.

6.1.1 KPI#1 Usability

KPI#1 for usability measures the quality of MaTHiSiS to meet its educational, i.e. to define current learning practices into highly individualized and adaptive, goal-oriented learning, while at the same pedagogical purposes and facilitate traditional educational structures. Also, it measures if the users (trainee or trainers) as a useful and functional tool.

6.1.1.1 Tutor

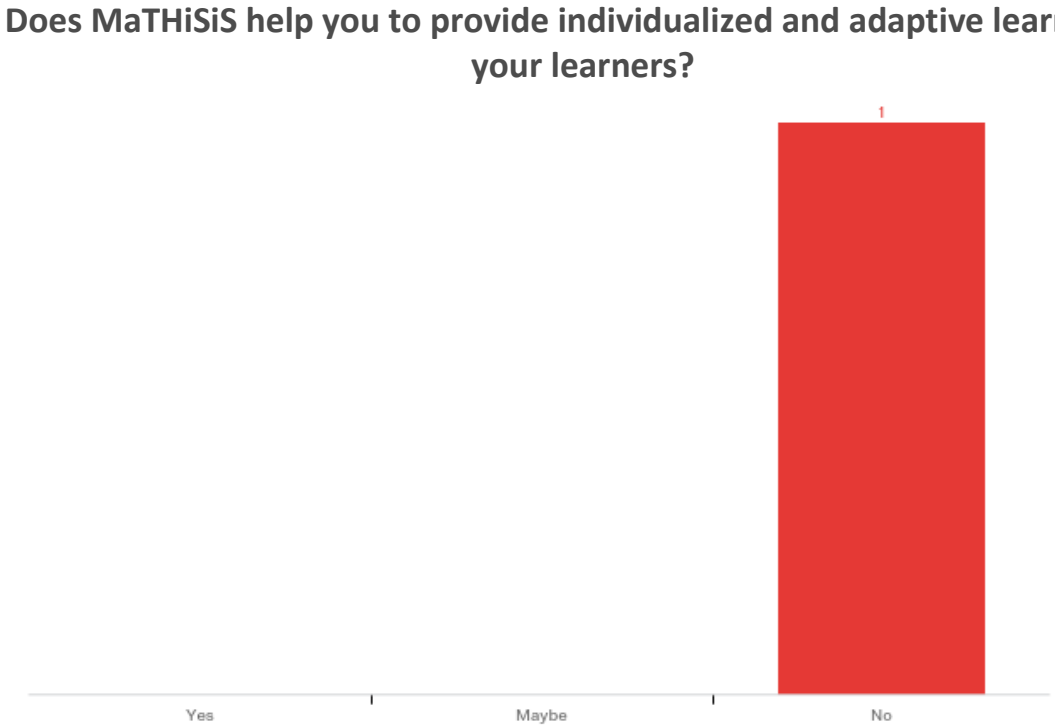


Figure 5: Tutor evaluation of the help of MaTHiSiS to tutor to adapt learning to learners during the training session

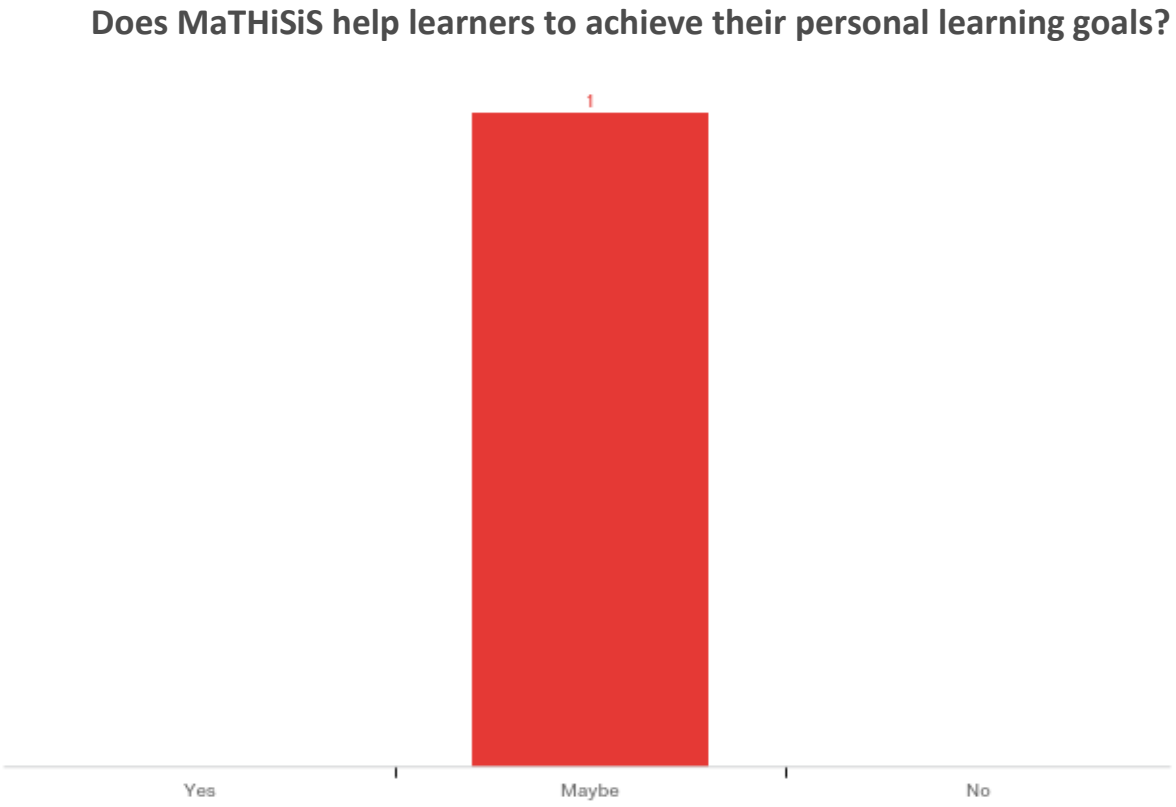


Figure 6: Tutor evaluation result of the help of MaTHiSiS to learners to achieve their personal learning goal during the training session

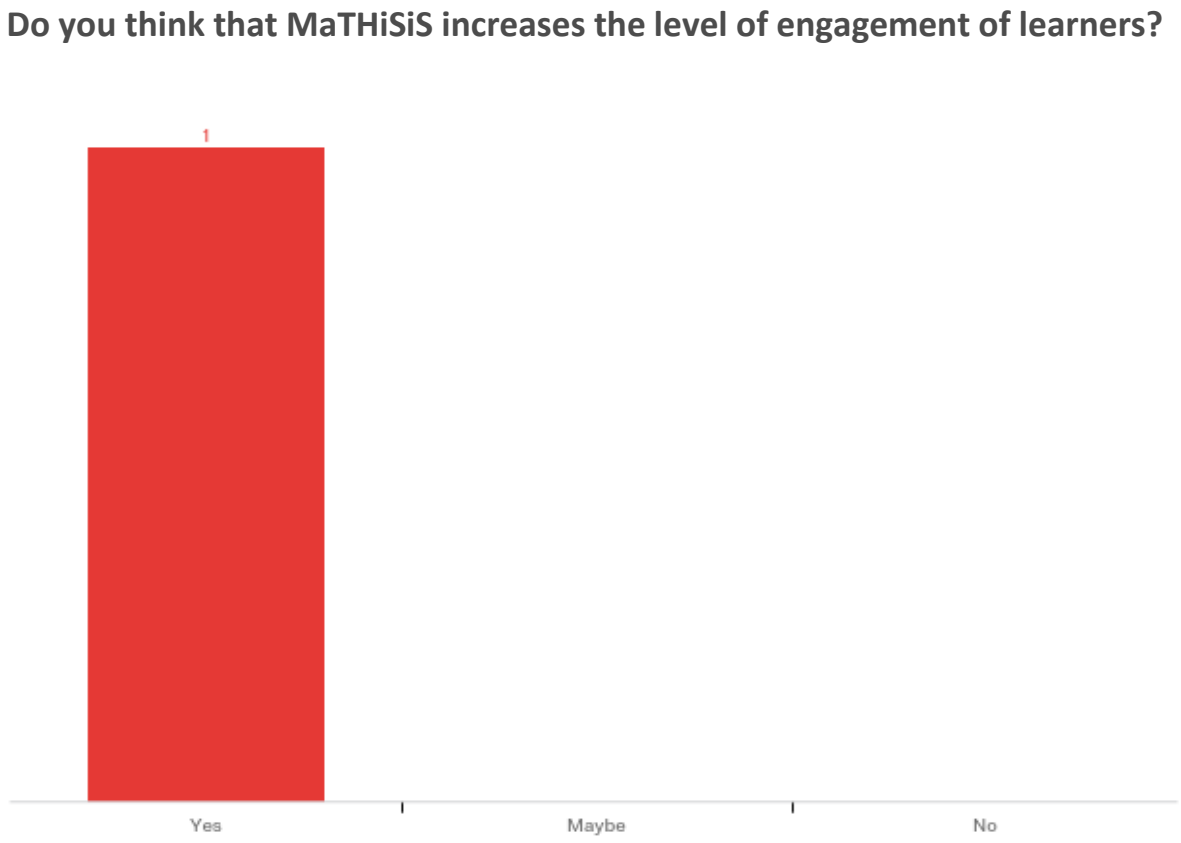


Figure 7: Tutor evaluation result of MaTHiSiS potential to increase the level of engagement of learners

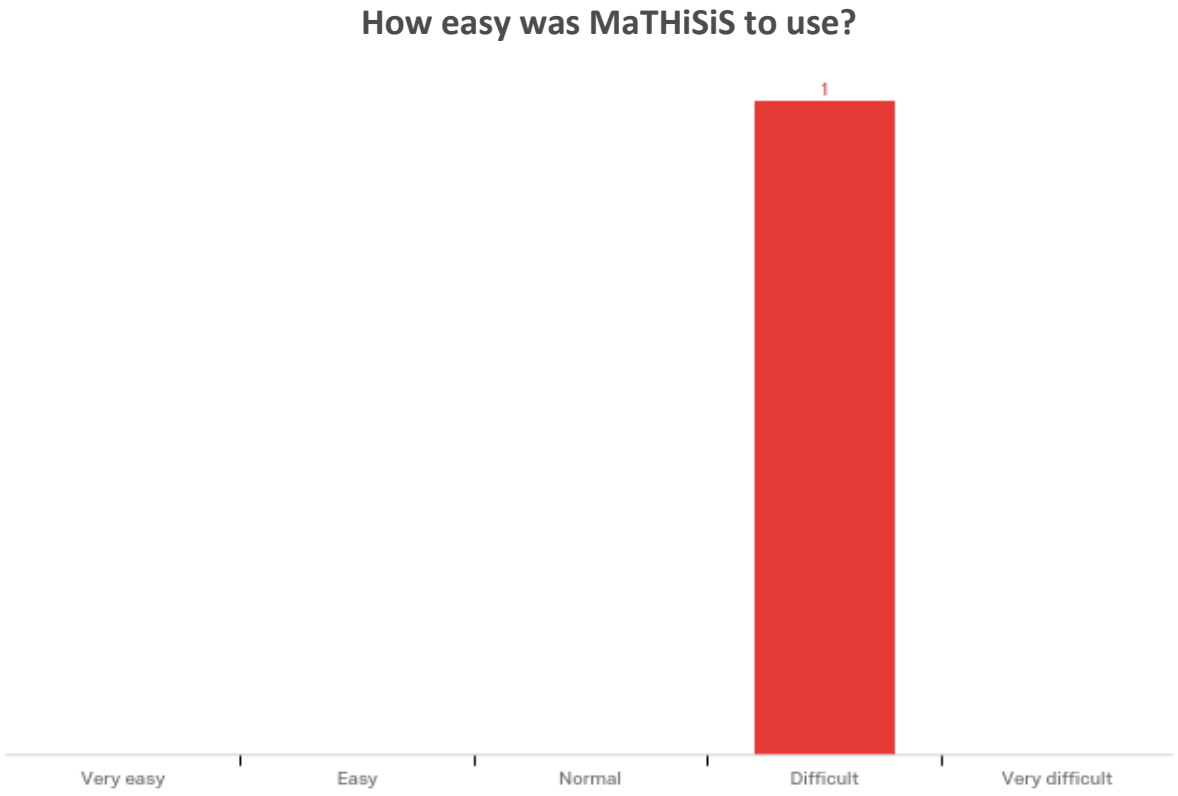


Figure 8: Tutor evaluation result of the easiness to use MaTHiSiS

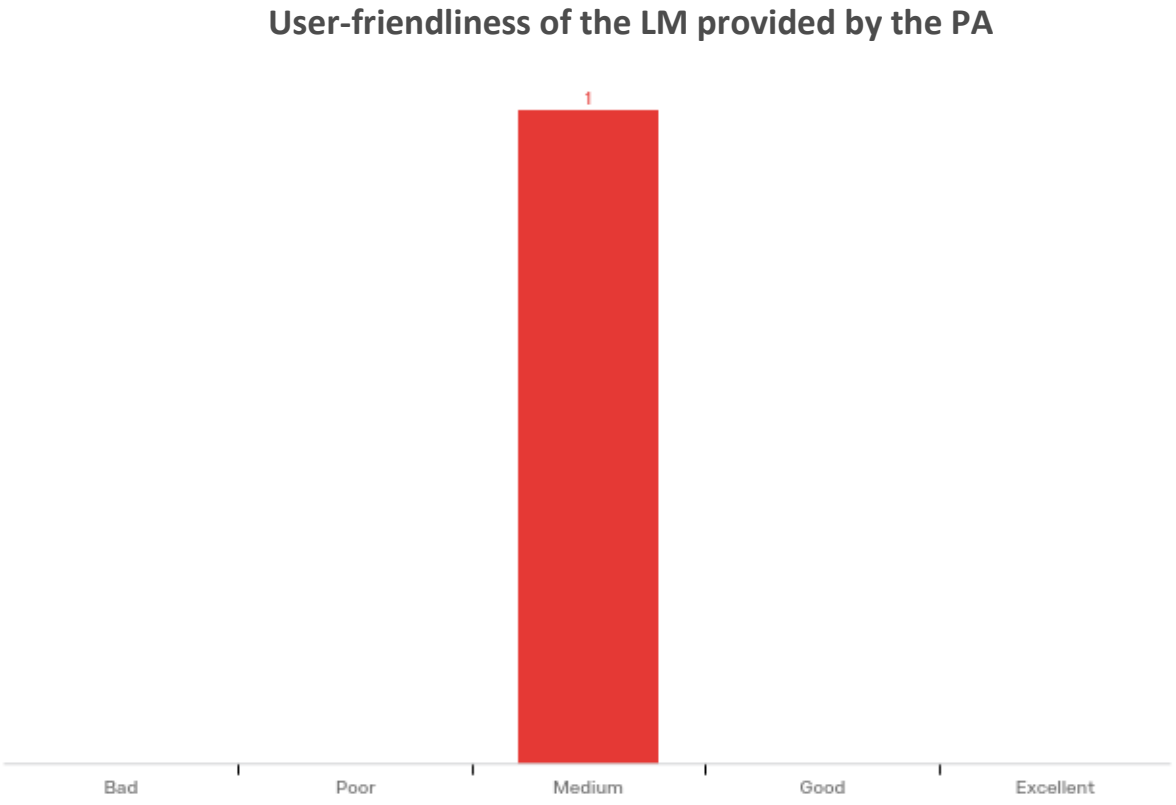


Figure 9: Tutor evaluation result of the user-friendliness of the LM provided by the PA

What are the main usability issues you found?

What are the main usability issues you found?
The LM do not finish.. PA and SC has to be set up by the user... the user cannot start the experience by his own...

Table 4: Tutor evaluation results of the main usability issue found during the training session

How many errors and bugs during the training sessions?

Answer	Count
0	0
1-5	1
6-10	0
11-15	0
16-20	0

Table 5: Tutor evaluation result of the numbers of errors and bugs during the training session

How many confusion/misunderstandings induced by the platform during the training?

Answer	Count
0	0
1-5	1
6-10	0
11-15	0
16-20	0

Table 6: Tutor evaluation result of the number of confusion/misunderstanding induced by the platform during the training session

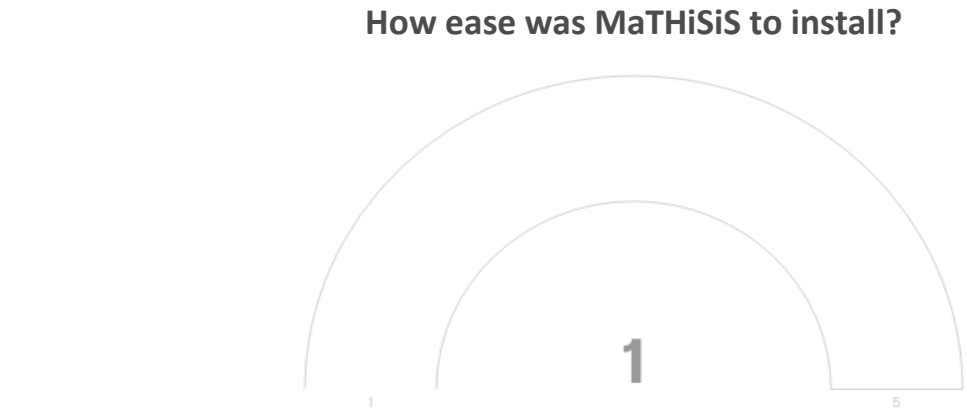


Table 7: Tutor evaluation of the easiness of MaTHiSiS installation (1=Bad, 2=Poor, 3=Medium, 4=Good, 5=Excellent)

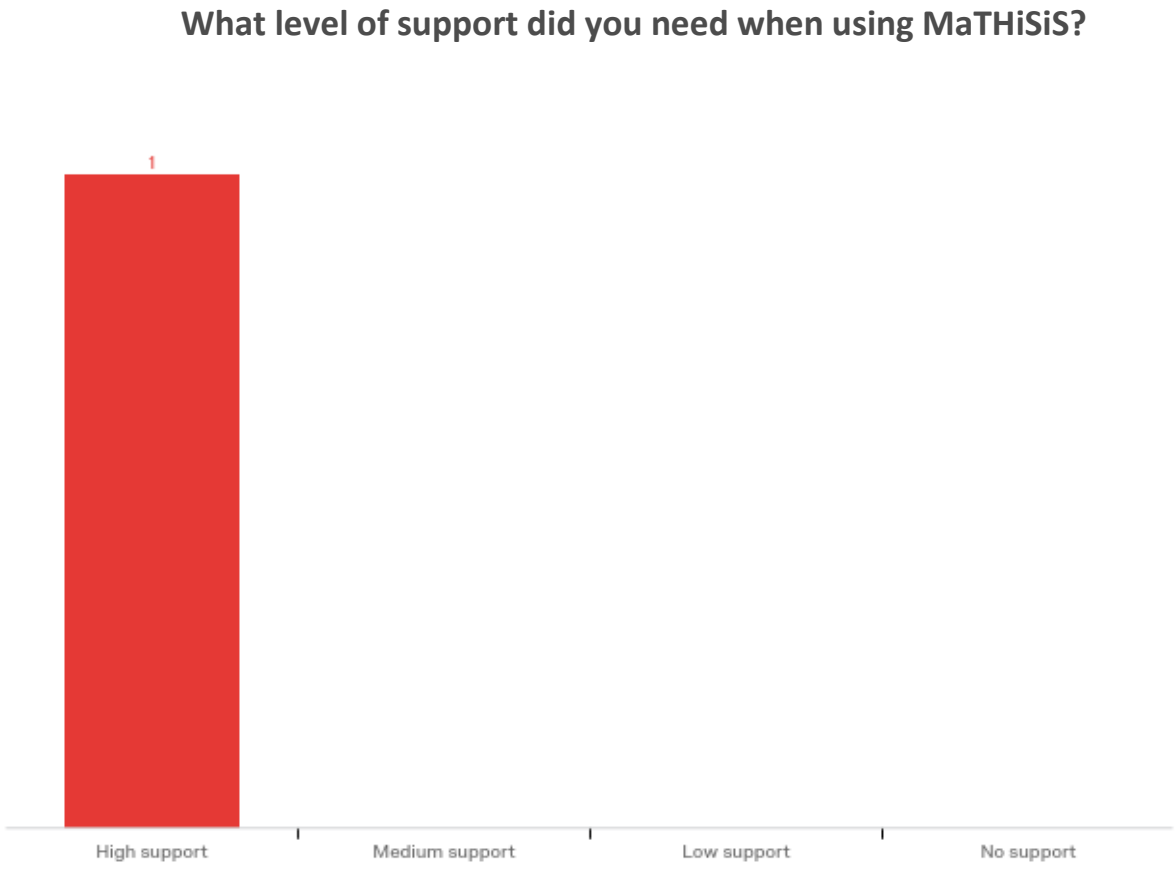


Table 8: Tutor evaluation of the level of support needed when using MaTHiSiS

If you have created Learning Graphs with the Learning Content Editor tool, how easy was it to create the Learning Graphs?

Table 9: Tutor evaluation result of the easiness to create learning graphs (1=Very easy, 2=Easy, 3=Norma, 4=Difficult, 5=Very difficult)

What are the main difficulties you experienced?

The tutor did not provide feedback on this question.

How much time was taken to set up SLAs?

How much time was taken to set up SLAs?
140 hours

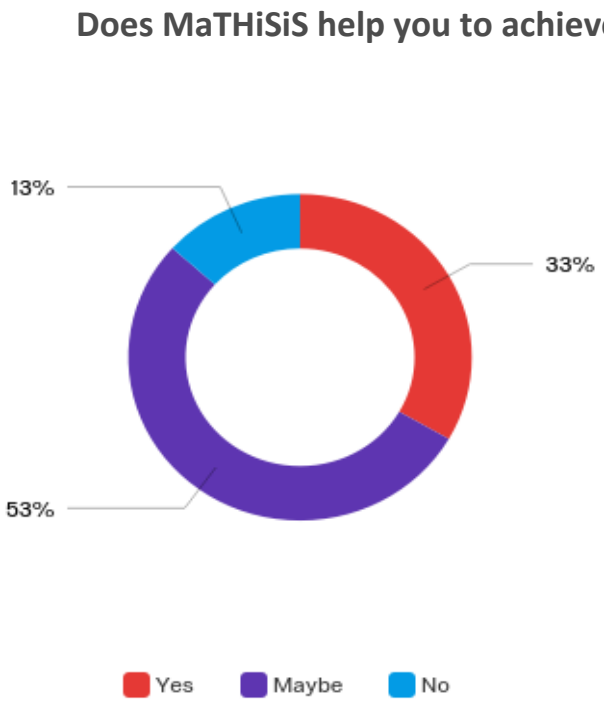
Table 10: Tutor evaluation result of the time taken to set up SLAs

How much time was taken to set up the Learning Graphs?

How much time was taken to set up the Learning Graphs?
7 hours

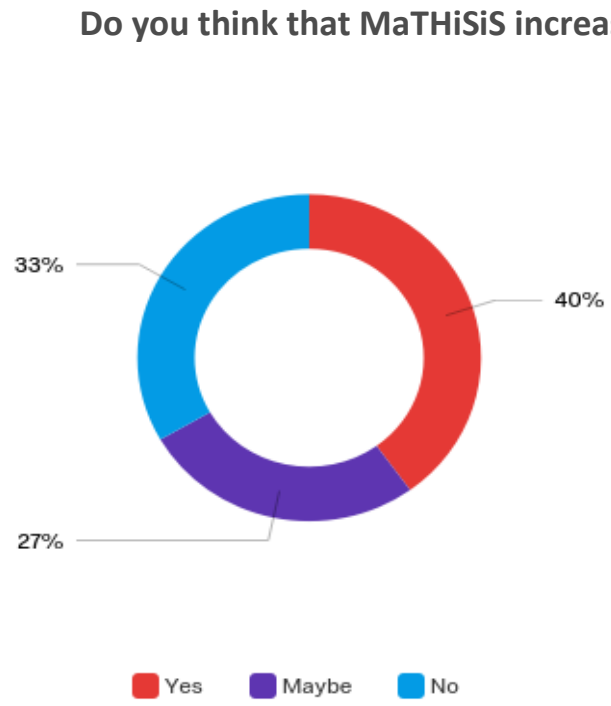
Table 11: Tutor evaluation result of the time to set up the Leaning Graph

6.1.1.2 Learners



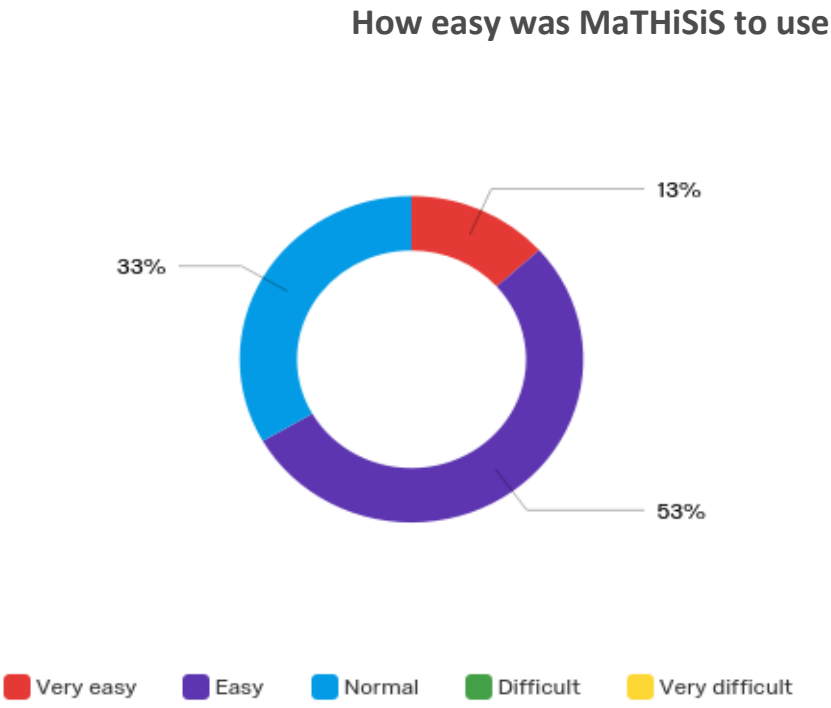
Answer	%	Count
Yes	33%	5
Maybe	53%	8
No	13%	2

Figure 10: Learner evaluation results of MaTHiSiS to learners to achieve their personal learning goals



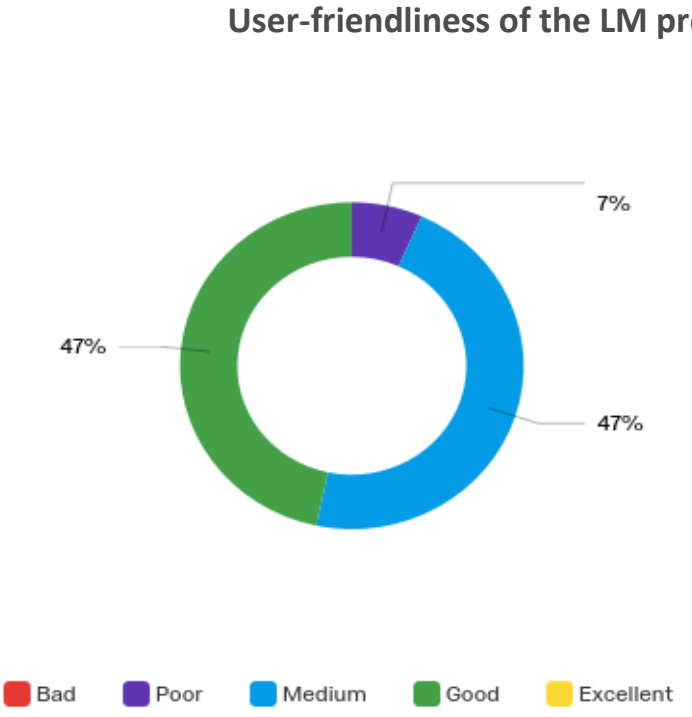
Answer	%	Count
Yes	40%	6
Maybe	27%	4
No	33%	5

Figure 11: Learner evaluation results of the MaTHiSiS potential to increase the level of engagement during the training session



Answer	%	Count
Very easy	13%	2
Easy	53%	8
Normal	33%	5
Difficult	0%	0
Very difficult	0%	0

Figure 12: Learner evaluation results of the easiness of MaTHiSiS use



Answer	%	Count
Bad	0%	0
Poor	7%	1
Medium	47%	7
Good	47%	7
Excellent	0%	0

Figure 13: Learner evaluation results of the user-friendliness of the LM provided by the PA

What are the main usability issues you found?

What are the main usability issues you found?
redundancies about quizz
Yes
no end in the Quiz after Level 3
Translating with other languages
none
I don’t know at the moment
for the autism studies
It can help with SIG software.
none
opens too many/multiples windows

Table 12: Learner evaluation results of the main usability issues they found

What level of support did you need when using MaTHiSiS?

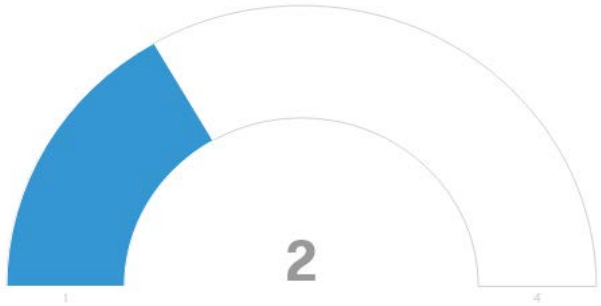


Figure 14: Learner evaluation results of the level of support need during the training session (1= High support, 2 = Medium support, 3 = Low support, 4 = No support

How many confusion/misunderstandings induced by the platform during the training?

Answer	%	Count
0	20%	3
1-5	40%	6
6-10	33%	5
11-15	7%	1
16-20	0%	0

Table 13: Learner evaluation results of the number of confusion/misunderstandings induced by the platform

6.1.2 KPI#2 Reusability

KPI#2 for reusability measures the capacity of the MaTHiSiS approach to provide learning content that can be used in different Learning Experiences, especially so in terms of the basic learning elements that it introduces, i.e. the Smart Learning Atoms (SLAs).

6.1.2.1 Tutor

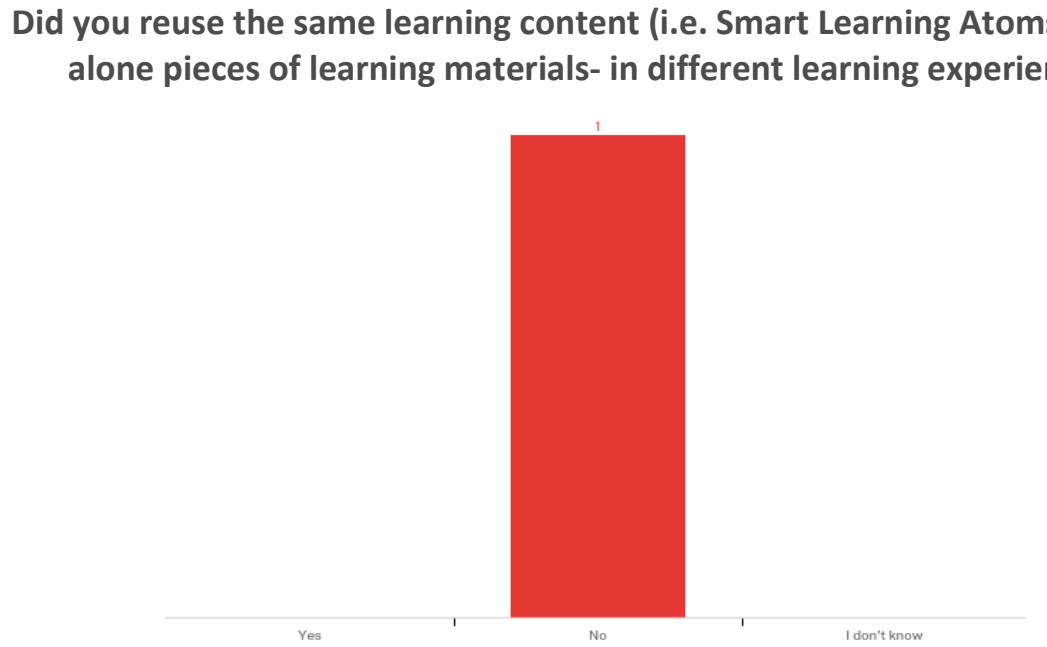


Figure 15: Tutor evaluation of the reuse of the same learning content during the training session

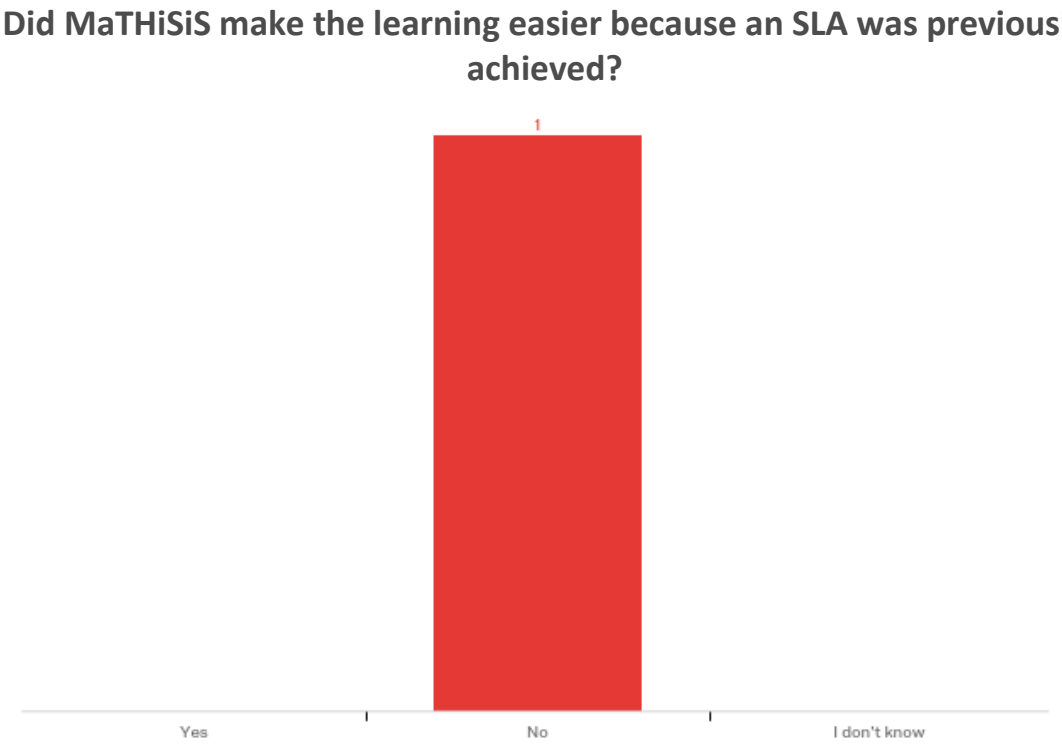


Figure 16: Tutor evaluation result of the potential of MaTHiSiS to make the learning easier because an SLA was previously achieved during the training session

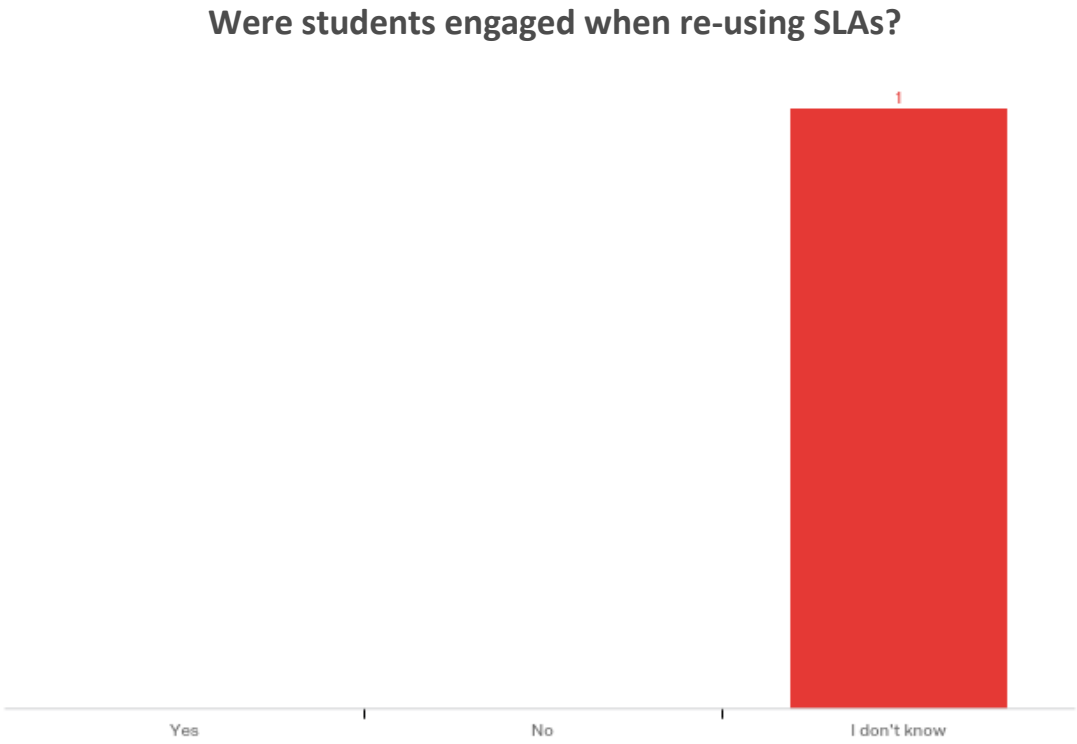
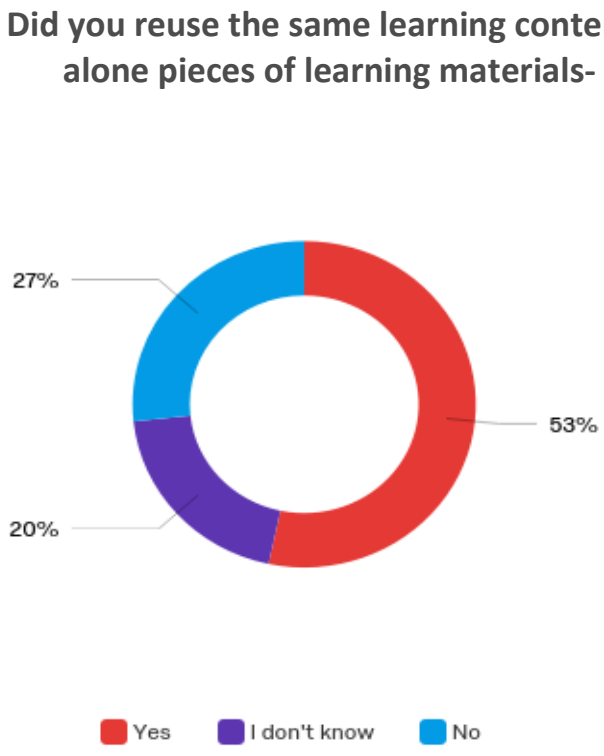


Figure 17: Tutor evaluation result of the engagement of learner when re-using SLA during the training session

6.1.2.2 Learners



Answer	%	Count
Yes	53%	8
I don't know	20%	3
No	27%	4

Figure 18: Learner evaluation results of the reuse of the same learning content during the training session

At the view of the results, it seems that learners evaluated they have used several time the same SLA while it's not the case. At the beginning of the training the tutor explained the different terms and

processes in the MaTHiSiS experience. Apparently the main concepts were not understood. The answer of the following questions may be not exploitable.

Did MaTHiSiS make the learning easier because an SLA was previously achieved?

For the reasons quoted before the answer of this question are not exploitable.

Were you engaged when re-using SLAs?

For the reasons quoted before the answer of this question are not exploitable.

6.1.3 KPI#3 Non-linearity

KPI#3 for the non-linearity measure the ability of MaTHiSiS system to create Learning Experiences that are decoupled from the traditional progression of learning goals and that support highly individualized goal-oriented Learning Experiences

6.1.3.1 Tutor

Did the system support efficiently goal-oriented learning instead of following a traditional progression of learning goals?

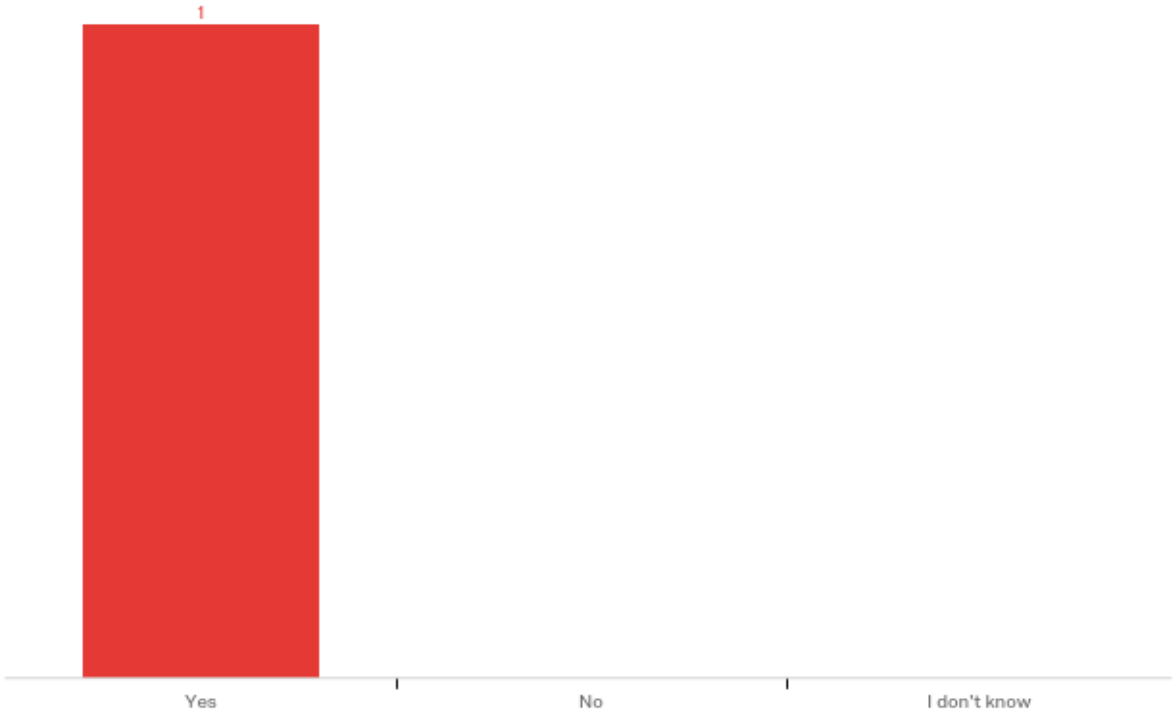
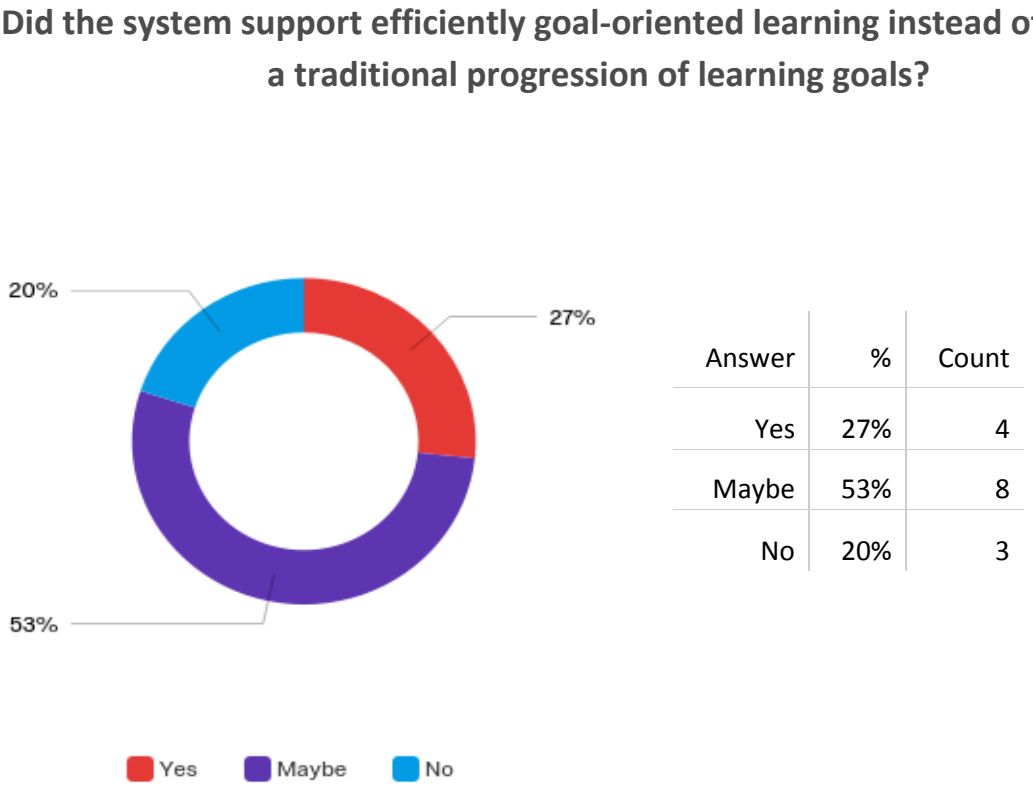


Figure 19: Tutor evaluation result of the MaTHiSiS potential to support efficiently goal-oriented learning instead of following a traditional progression of learning goal during the training session

6.1.3.2 Learners



Answer	%	Count
Yes	27%	4
Maybe	53%	8
No	20%	3

Figure 20: Learner evaluation results of the MaTHiSiS potential to support efficiently goal-oriented learning instead of following a traditional progression of learning goal during the training session

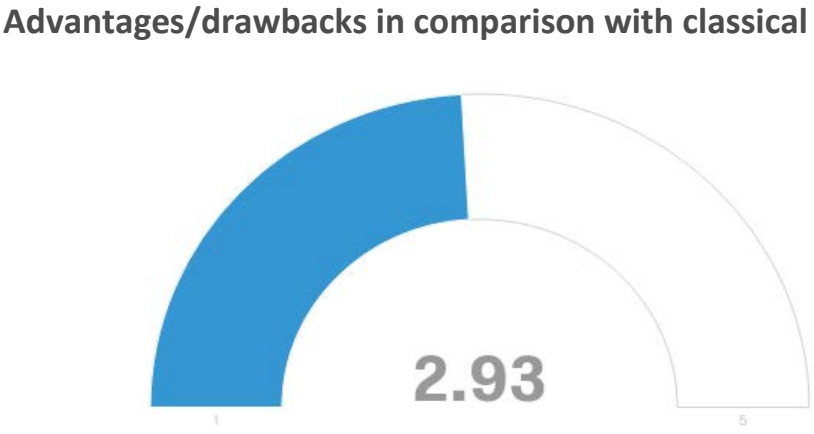


Figure 21: Learner evaluation results of the advantages/drawbacks in comparison with classical training (1=Excellent, 2 = Good, 3 = Medium, 4 = Poor, 5 = Bad)

6.1.4 KPI#4 Ubiquity

KPI#4 for ubiquity measures the ability of the MaTHiSiS platform to support learning across a variety of educational contexts, i.e. learn anywhere, anytime for the same learning objectives.

6.1.4.1 Tutor

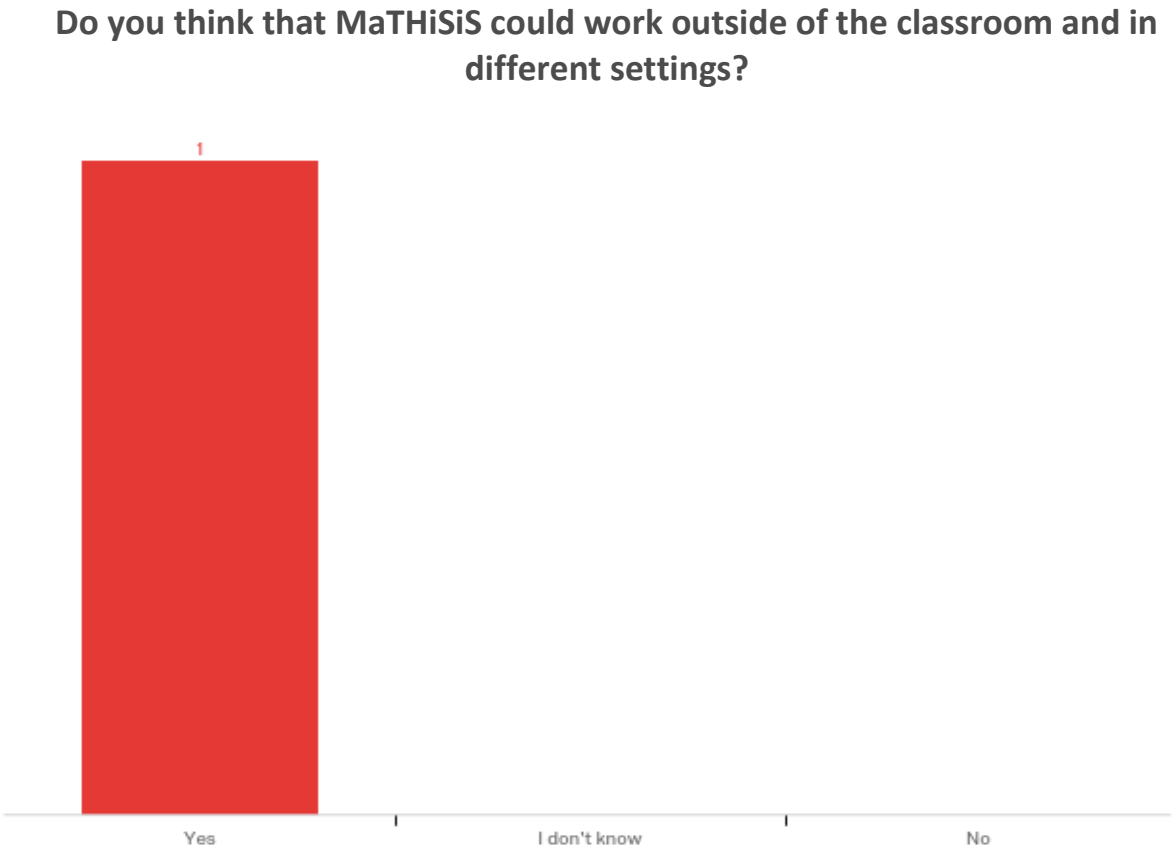


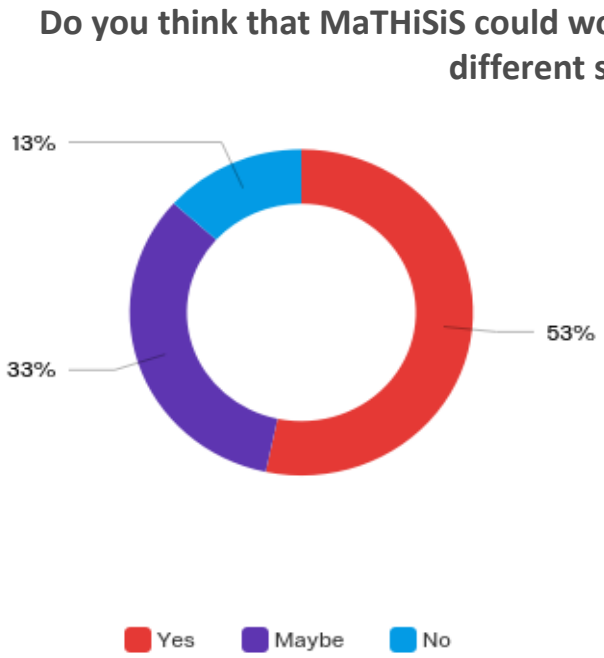
Figure 22: Tutor evaluation result of MaTHiSiS potential to work outside the classroom

In what other setting do you think this could be used?

Answer	Count
Workstation	1
Outdoors	1
Other	0

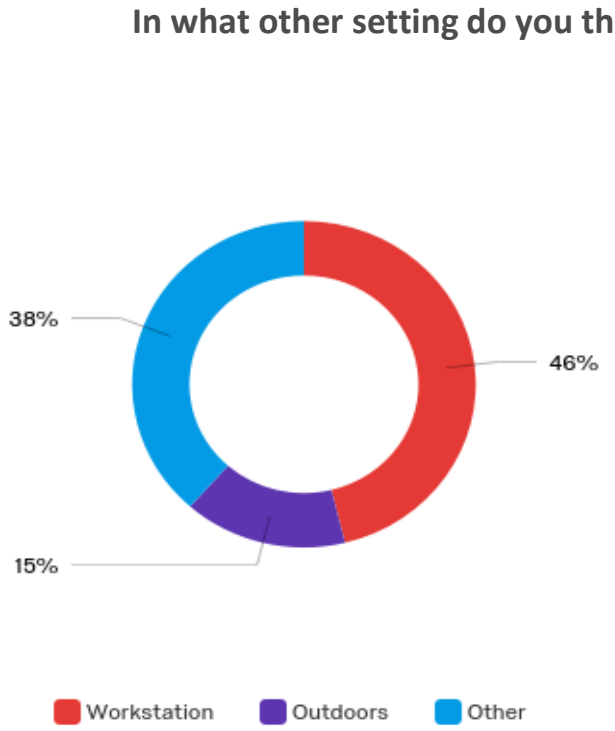
Figure 23: Tutor evaluation result of the other setting that could be used

6.1.4.2 Learners



Answer	%	Count
Yes	53%	8
Maybe	33%	5
No	13%	2

Figure 24: Learner evaluation results of the MaTHiSiS potential to work outside the classroom



Answer	%	Count
Workstation	46%	6
Outdoors	15%	2
Other	38%	5

Figure 25: Learner evaluation results of the other setting that could be used

Name the other settings it could be used that are not listed above

Name the other settings it could be used that are not listed above:
MaTHiSiS could be used for initiation (for one subject) and validate achievements of this subject. Between this, it must be a teacher to transmit knowledge.
House, at home
At university

Table 14: Learner evaluation results of the other setting it could be used but not listed in the previous question

6.1.5 KPI#5 Ethical adherence

KPI#5 for ethical adherence measures the quality of MaTHiSiS to comply with appropriate ethical protocols of the technical/research institutions that are involved in the deployment of MaTHiSiS and also of the schools or organizations testing it.

6.1.5.1 Tutor

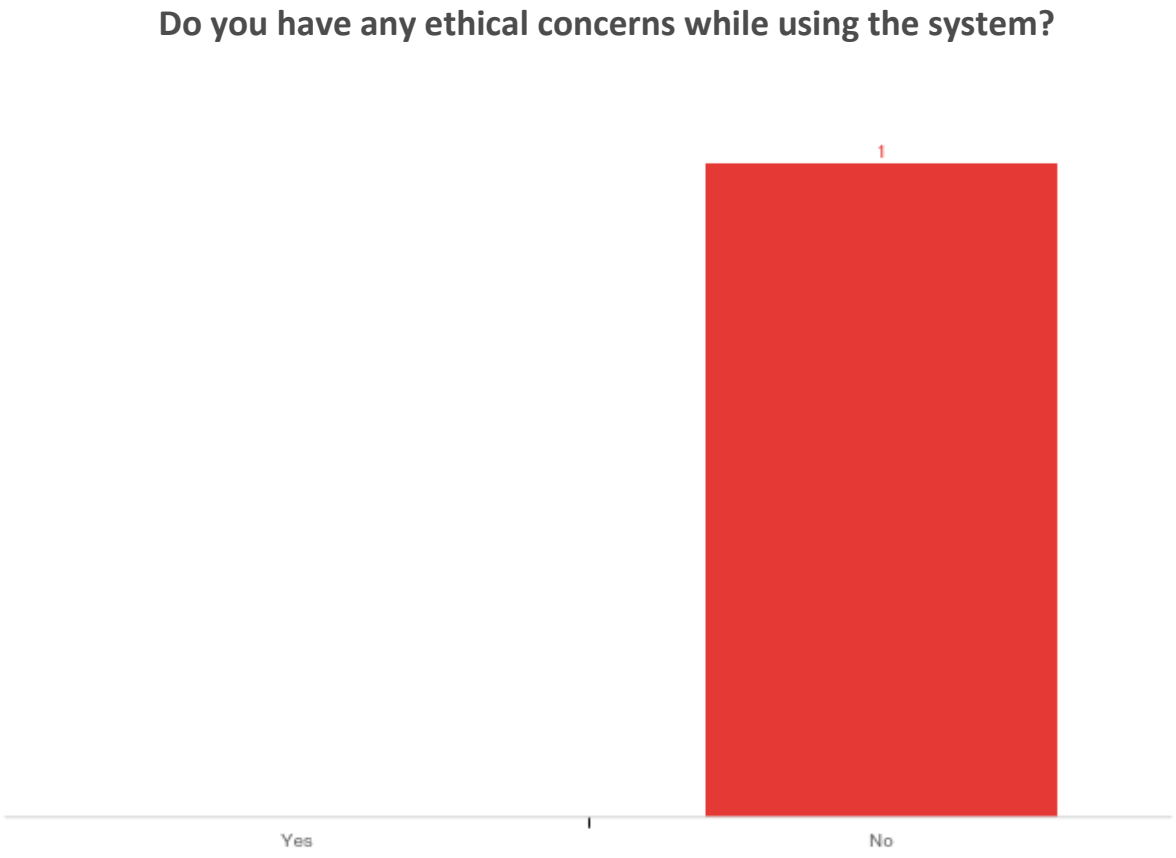
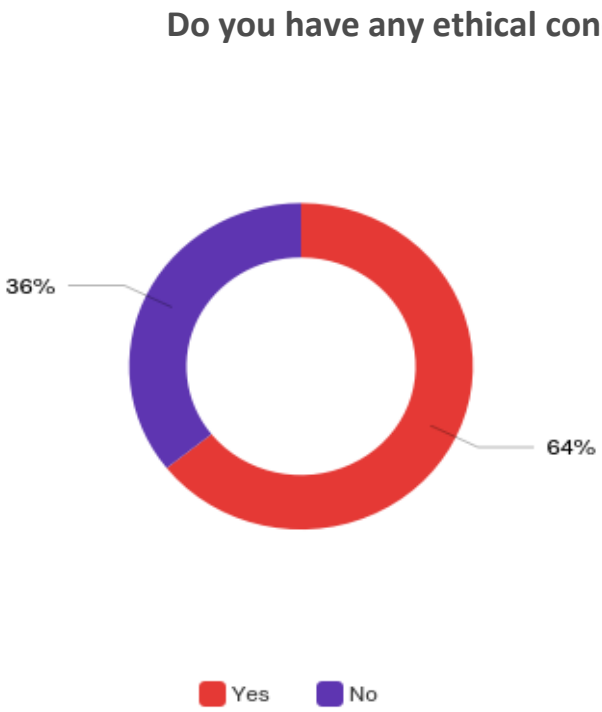


Figure 26: Tutor evaluation result of the ethical concerns while using the system

6.1.5.2 Learners



Answer	%	Count
Yes	64%	9
No	36%	5

Figure 27: Learner evaluation results of the ethical concerns while using the system

If yes, which ones and how can they be resolved?

If yes, which ones and how can they be resolved?
They can if you continue this project, I'm against IA in all situations. We get unemployment problems, and IA will increase them.
Users must be kept abreast of the use of the data (which, for what purpose)
Utilization of my personal data
Security
Anonymity
The use of a webcam to analyse the people's face

Table 15: Learner evaluation results of how the ethical concerns could be resolved

6.2 Focus group

Additionally to the surveys, focus group interviews of tutors were performed during the Assisted Pilot phase. The following sections present in detail the focus group implementation and analysis of the answers received. The analysis was done in two stageS, a common analysis with the Carrere Guidance Distance Leaning case (CGDLC) since some similarities were noticed and a second one for the specific ITC questions.

3.1.1 Focus Group Implementation

The focus group of the ITC scenario took place in December 2017, just after the completion of the assisted pilots. IDGEO tutor was asked to give further feedback by attending the interview. The interview was performed remotely in order to be recorded to facilitate the transcription.

An interview guideline was provided as baseline to perform the focus group. The questions were translated in French and the interview WAS performed in the tutor native language to allow him to give more detailed answers.

Afterward, the answers were transcript and then translate in English.

3.1.2 Focus Group Questions

The following questions were asked during the focus group interview.

EDUCATIONAL DIMENSION

The educational dimension was the main part treated differently by the ITC and the CGDLC. The ITC focused on the reuse of an SLA within the educational process.

- To what extent could you use an SLA for more than one learning goal?
- How many SLAs could you reuse?
- How easy was it to create easy, medium and hard levels for each for each SLA?
- Some SLAs contribute to more than one learning goal. If you've already worked on that SLA for one learning goal, we want to know whether that helped you and your student when working on a second learning goal to which that SLA contributed?
- Did MaTHiSiS make the learning easier because an SLA was previously achieved?
- Some SLAs need to be achieved before other ones are possible. Does the system take into account that an SLA has been achieved?
- Were students engaged when re-using SLAs?
- From your point of view, what are the benefits to students and educators of using MaTHiSiS in learning and teaching, respectively?

ORGANIZATIONAL DIMENSION

- Which are the organizational aspects that should be considered when adopting and using MaTHiSiS (i.e availability of equipment, size of the class, sessions with students, time to prepare classes)?
- Do you think that teachers would need technical skills for the use of MaTHiSiS?
- Is the technology cost and learning curve a barrier to adopt the MaTHiSiS solution?
- From your point of view which are the main barriers for the use of MaTHiSiS in your schools?
- Does your organization have a plan for the integration of technology in the classrooms?

USABILITY AND ACCESSIBILITY DIMENSION

- What sort of problems did you have in using the system: for different aspects of the system – switching it on, setting up the SLAs, level of feedback from technical problems?
- How long did it take to get used to using the system?

- What level of support did you need to use the system? Did you need support with some aspects more than other? Could you use it on your own? Did you ask for help? If so, how many times?
- How easy was it for you to use the separate aspects?
- How easy was it for your students to use the system?
- Did you achieve with them what you wanted to?
- What were the best and worst aspects of the system?
- Could it be used by any of your users with physical, sensory and cognitive impairments?
- How can MaTHiSiS be improved?
- Would you recommend it to your colleagues? If not, why not?

SOCIAL DIMENSION

- Do you think that MaTHiSiS improves social interaction between teacher and learners and collaboration of students with others?
- Did students enjoy using MaTHiSiS?

ETHICAL DIMENSION

- Do you have any ethical concerns about the system?
- If any, how could these be resolved?

3.1.3 Focus Group Answers Analysis

Within the analysis section, not only answers of the ITC were taken into consideration, but also, answers of the counsellors of Career Guidance Distance Learning Scenario was also included, since some similarities were noticed.

Both quantitative and qualitative analysis aim to reduce and summarize a larger body of data to a more manageable “message” or “set of messages”. However, the biggest difference is that quantitative analysis aims to answer questions about figures. Qualitative processes are not concerned with numbers but with what was being said and sometimes how it was said. A group of researchers implemented the thematic analysis of the focus group to identify patterns of meaning across a data set that provides an answer to the research question being asked following the steps below:

1. **Familiarization with the data**: read through the transcripts to get an idea of the context in which interesting sections of text occur.
2. **Generation of initial codes:** Codes are essentially tags or labels which are assigned to sections of the text that are of interest to enable categorization of key concepts while preserving the context in which the concepts occur.
3. **Searching for themes**: which involved grouping all codes into potential themes.
4. **Reviewing themes**: between partners.
5. **Refining and naming themes**: set for each theme a clear definition making sure it has a meaningful label, definition, inclusion criteria, exclusion criteria and examples of positive and negative occurrence.

FOCUS GROUP (CGDL CASE) THEMES AND COMMENTS

Educational Dimension

- Interesting & Challenging/Engagement
- Lack of Depth
- Faster Learning

- Realistic Exposure
- Time & Space Elasticity
- Curiosity & Enthusiasm
- Individualized Learning
- Barriers in Individualised Learning
- Automatic Evaluation
- Not Clear Evaluation
- Repetition
- Innovative
- Interactivity

All counsellors totally agreed on the efficiency of MaTHiSiS. The SLAs were characterized as interesting and challenging, while they learn "quicker" compared to the traditional method. One counsellor mentioned the learner's background as a dimension to measure efficiency. In addition, all counsellors mentioned individualization and adaptivity as main characteristics of MaTHiSiS. Different activities and different learning goals contribute to this. One counsellor mentioned that the platform is "quite adaptive" possibly due to technical problems.

Finally, all counsellors mentioned the time and location elasticity (learners can complete the SLAs on their own pace (rhythm) and from different places (house). Repetition and automatic evaluation were also referred as main benefits. Concerning the issues, counsellors expressed their concerns on the "heavy" technical requirements (good internet connection, pre-installations) and more details on the learners' progress.

In the ITC, it was evaluated that the re-use of an SLA could facilitate the development of the educational content. No specific assessment was given on the impact for the learners. However, the tutor was convinced of the platform potential as it allows interactivity and individualized learning.

Organizational Dimension

- Time preparation
- Test
- Time & space elasticity
- Time exposure
- Teacher training
- Technical skills
- Data protection
- Material

In both ITC and CGDLC, tutors agreed that they need minimum technical skills. Different aspects of the platform were evaluated as not user-friendly.

Counsellors of the CGDL scenario, also mentioned technical aspects and difficulty in usage. C1 made a significant comment on the aspect of culture (e.g. in Greece people are not very technical-minded). C2 belongs to a public organization, so the cost of the resources needed was mentioned as a main barrier. C3 highlighted the dimension of additional support (training) because of the difficulty in usage.

The Industrial Training scenario trainer was specifically asked about the cost of MaTHiSiS (if it is a barrier) but the answer was negative (unlike CGDL counsellor C2). Difficulty in usage and technical issues (both similarly to CGDL counsellors) were mentioned as barriers. The ICT tutor specifically point underlined the complexity of launching and setting the platform. Moreover, one noteworthy comment was about the data protection, since some learners refused to participate due to doubts concerning certain parameters. Finally, the trainer expressed possible integration of technology in their classrooms by adding webcams in the future.

Usability and Accessibility Dimension

Trainers

- Creation tool
- Launching
- ICT Knowledge/Technical Skills
- Technical Support
- Not User-Friendly
- Complicated

Learners

- Individualized learning
- Cognitive barriers
- Intellectual barriers

Concerning the CGDL scenario, the counsellors characterized the platform mainly as complicated and they needed support not only to create their LGs but also to interpret the learners' progress graphs. However, the Industrial Training scenario trainer also mentioned complicacy concerning the LMs creation (didn't understand the process since technical partners created the content at this stage). Concerning the students, the fact that the sensorial component and platform agent client should be launched locally on each device, is of additional complicacy for the process. Concerning the level of support, the trainer also mentioned that little more support is needed, especially when referring to the learning material creation. The ICT trainer assessed at this stage the platform could not be used in real cases as trainers do not have access to all functionalities in order to create content. A more integrated and user-friendly creation tool was recommended.

Improvements concerning the user interface and the compatibility with mobile devices of different dimensions would be useful. In addition, the Industrial Training scenario trainer mentioned that the trainees found the initialization process quite "painful" (setting up of local clients and components). However, the educational process itself continued smoothly. As worst aspect of the system the part of clients set up at each device was mentioned (similarly to CGDL). ICT tutor also evaluated that with the actual configuration of the ITC, cognitive and intellectual impairment could be a barrier.

Social Dimension

- Reduction of teacher interaction
- Learner collaboration
- Interest
- Curiosity & enthusiasm
- Frustration
- Easy & Straightforward
- Enjoyment

In both cases, the trainers/counsellors mentioned that all learners actually enjoyed the process, since it was something new and innovative. ICT trainer, mentioned that even if the MaTHiSiS platform decrease the interaction between tutor and learner, it give new collaboration possibilities between leaners.

Ethical Dimension

- Anonymity
- Data management by learners
- Combination with face-to-face Sessions
- Learning Restrictions (Learning to complicated to be restricted by mechanical procedures)

Both CGDL and Industrial Training scenarios' counsellors/ trainers, expressed some concerns about the anonymity of the students, since names and surnames are known. So, the extend of anonymity didn't seem so clear. The matching of names with codes or pseudos was mentioned as a solution as well as the possibility for learners to manage their collected personal data.

6.3 Improvements to be made for the Real-life Pilot

The conclusions of the evaluation results are explained in the section 5 of this deliverable. Below the written feedback received from learners and tutors for the improvements to be made for the Real-life Pilot phase, is illustrated.

Which improvements to be made for the Real-Life pilots?
All is great, was a pleasure to do it
Maybe
Too many redundant questions
Optimization of the quiz, questions are too redundant
I don't know, what is Real Life pilots????
It can be more easy to use
You should place the "skip button" on the left, not right and not underlined

Table 16: Learner evaluation results of the improvement to be made for the Real-Life pilots

During the training learners reported minor improvements that are not listed above:

- A quiz could be pass without choosing an answer
- After launching the SC client the windows is not visible. Learners have to click on the icon within the Windows taskbar to make it appear. Their first reflex was to think it is not working.
- Few sentences in the LMs were not in the same language.

Which improvements to be made for the Real-Life pilots?
Make the installation easier, SC/PA has to be integrated, within the platform a tool to set up quiz for the trainer, a solution to visualize engagement of the trainees, a tool to set up the LM

Table 17: Tutor evaluation results of the improvement to be made for the Real life pilots

According to the tutor feedback, the setting of the sensorial component and the platform agent clients is the main improvement to be done for an autonomous use of MaTHiSiS. For the moment, the setting of the client seems too complex to allow that as users need to be trained to the concept of a sensorial component and a platform agent.

A second barrier for the remote training by the learner is the firewall problem. To solve this problem we had to request the support of a technical partner, learners will not have this opportunity. Majority of people will not have the skills to understand the problem and solve it.

The tutor expressed the willingness to integrate directly the LMs without asking the technical partners. During the Assisted Pilot preparation phase, it slowed down the test. If the tutor has the possibility to do it with a tool, he could test and improve the LMs more quickly.

An optimization of the platform has to be implemented to allow learners to finish the quiz after reaching all the SLA level 3.

It was also noticed time between two SLAs is quite long. At the first time, learners thought the platform crashed.

Another improvement is the possibility to choose several answers within the quiz.

7. Conclusion

The ITC Assisted Pilot was organized on one day, the 20th of November 2017 in IDGEO premises. It was composed of two group sessions, the morning consisting of 8 learners with one tutor and the afternoon 7 learners with one tutor. Each session was split in two sub-phases: a pre-training and a physical team training. 9 different PAs were used and 2 LGs, 6 related SLAs and 20 LMs were created.

The MaTHiSiS Platform was successfully used by the tutor and the learners with minor technical and organizational problems. The pedagogical objective of the ITC training and the usage of TerraHub Platform independently in order to develop services and products using space and geomatic data, was reached.

The learners and the tutor were keen to participate to an experimentation of a new kind of pedagogical tools reacting to their emotions. Learners were happy to participate even if some frustration was perceived due to non-end problems. This new pilot gave the opportunity to the tutor to better understand the potential of MaTHiSiS for developing a non-traditional learning experience for learners. He appreciated the exercise of designing LGs as it force him to think differently his teaching program. However the organization and installation process remain for him the main drawback of the MaTHiSiS solution.

For the real-life pilot, the setting of the SC client and PA client should be simplified in order to allow a remote use of MaTHiSiS by learners. An improvement should be done to allow the automatic end of the experience after learners reached all the level 3 in the quiz. No specific evolution of the LG is required for the Real-life pilot.

The results of this document will be used as an input for the organization of the ITC Real-life pilot phase.

8. References

[1] Scriven, Michael. "Beyond Formative and Summative Evaluation." In In M.W. McLaughlin and ED.C. Phillips, eds., Evaluation and Education: A Quarter Century. Chicago: University of Chicago Press, 1991.
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[3] NTU (ed.)] "D9.1 Report on Industrial Training pilots" Deliverable of the MaTHiSiS project, 2017
[4] AV (ed.), "D2.2 Full scenario of all use cases" Deliverable of the MaTHiSiS project, 2016.