

Interreg



Sudoe

ADDiTOOL

European Regional Development Fund



D3.1.1: LEARNING REPORT

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1. INTRODUCTION

This deliverable aims to report the activity of the creation and lecturing the transnational learning course on Metal Additive Manufacturing. The activity is dedicated to the knowledge transfer for students of each university and engineering school by creating a new learning module and focused on MAM for the tooling industry.

Although Metal AM technologies do not replace any traditional manufacturing process, they are an essential catalyst for creation and innovation and act as a good complement to improve competitiveness. However, although the potential scope for the adoption of these technologies in all sectors (and particularly in tooling sector) is considered to be very large and can have a disruptive impact, the level of knowledge and adoption of Metal AM still remains low, particularly if the analysis focuses on SMEs.

Several analyses highlight the demand on training for AM processes but one of the most recent and direct ones has been published by Thomas-Seale et al.¹, where literally states that “A paradigm shift in education is required to increase graduates understanding of Additive Manufacturing” and subsequently identifies the Education as one of the barriers for the implementation of the AM processes. Most of the die & mould manufacturers in Europe are still SMEs with high innovation capacity but low or null training on Metal AM processes.

Thus, the 3.1 activity have involved the creation of a new educational program for engineer students, duplicated in all the universities and Engineering schools from ADDITOOL partners. This course include Theoretical courses, experimental work on labs and visits to the local ecosystem of each partners.

The training module have been dispensed by ENIT, ESTIA, FADA CATEC, IPLEIRIA and UPV/EHU in their own facilities. In addition, CEIT and LORTEK have also participated in the design and creation of the module and visits from the students to their facilities.

¹ L.E.J. Thomas-Seale, J.C. Kirkman-Brown, M.M. Attallah, D.M. Espino, D.E.T. Shepherd, The barriers to the progression of additive manufacture: Perspectives from UK industry, Int. J. Production Economics, Vol. 198, pp 104-118, 2018

2. Training Module design

2.1. General Overview

The proposed Training Module includes specific training in Metal AM for the die and mold sector. A 10-day course has been designed for engineers and technicians with some experience in the sector and with a previous degree training. The aim is to go into more detail on specific aspects of Metal AM processes applicable to the tooling sector, including not only manufacturing processes, but also design and inspection procedures. Thus, the final objective is to accelerate the introduction of MAM techniques in die and mold companies through the training of specialized people. Within this objective, special emphasis is placed on the recruitment of people in SMEs.

In order to achieve this objective, the Training Course has been divided into 6 main modules, which are further divided into more specific topics. The aim is to cover all the relevant contents of Metal AM and its potential application in the tooling sector. The documentation, which has been created by all project participants, is distributed to all students and serves as a basis for the theoretical part of the course.

In addition, the course includes a 3 days practical part, where students can analyze real additive manufacturing systems, observe real parts in-situ and perform validation measurements. This content, given that experimental equipment is required, is adapted to each center that teaches the course, using the equipment available at each laboratory. Finally, there is a scheduled visit to a platform or to an industrial company working with AM.

The course content was selected based on feedback from the different partners. In a series of meetings, the modules were agreed upon to cover the most relevant content. The general content includes the following topics:

- Introduction to the tooling sector & MAM technologies
- Materials for MAM adapted to the tooling sector, including both powders and wires
- Multi-process design rules for PBF, DED wire laser, DED wire arc, DED powder laser, ...
- Topological optimization adapted to MAM
- Programming of trajectories both for cartesian machine-tools and robots
- Practical work, which will rely on equipment of each partners
- Visits to the local ecosystem

Once the modules were defined, they were distributed among the partners so that each one could elaborate the detailed slides and contents.

2.2. Training course modules

The training course is divided into 6 modules with a series of contents. All the modules include a series of slides and additional material (media, web links, references,...) to help to students to follow the content of the course.











The course has been designed with a face-to-face methodology, with the aim of involving the students in the theoretical classes as well as in the workshop practices and visits. However, the theoretical content is prepared for its potential implementation in online teaching platforms and the possibility of teaching the course remotely. As for the number of students, the limit is set by the facilities where the practice work is carried out, but in any case, the number of students per course is limited to 15. The following table show the content of each module:

TOPIC/MODULE TITLE	POSSIBLE CONTENT
INTRODUCTION TO THE TOOLING SECTOR	Market definition Tooling type depending on activity Tooling types Opportunities of MAM technologies
INTRODUCTION TO MAM TECHNOLOGIES	AM processes overview Material for tooling & choice criteria AM Raw material Market definition Metallurgy introduction
DESIGN RULES FOR MAM TECHNOLOGIES & MANUFACTURING METHOD	PBF Laser Binder Jetting DED Wire Arc DED Wire Laser DED Powder Laser FFF Metal AM post-processing
TOPOLOGY OPTIMIZATION	General concepts Application for the Die & Moulds Metal AM and TO
PROGRAMMING OF TRAJECTORIES	Machine Kinematics Hybrid Machines CAM programming for AM – Robot & Cartesian Machines PBF CAM step: Slicing and layer programming FFF CAM step: Slicing and layer programming
MAM FOR TOOLING	Choice of the technology & the material Potential / Benefit Manufacturing procedures Monitoring & Digital Twin Characterization & Metallurgy AM part inspection Practical training sheets

2.3. Training course accessibility and content

The training modules preparation were finished since January 2022, so the courses could start from these dates. Therefore, the implementation of the courses has follow a smooth and previously planned scheduled. Moreover, at the end of a course, an evaluation of the students was carried out, gathering their impressions, aspects for improvement, etc. The results were analysed and transmitted to the other partners to be considered in the implementation of the next course.

All the training modules and relevant information were shared on the Teams platform. The slides and content were organised by days and the presentations include also comments to explain the different subjects.

Documents > General > ADDITOOL > WP3 Formation > Act.3.1 Students training module			
	Nom ▾	Modifié ▾	Modifié par ▾
	Day 1	26 novembre 2021	eukar.ehu
	Day 2	26 novembre 2021	eukar.ehu
	Day 3	26 novembre 2021	eukar.ehu
	Day 4 & 5	26 novembre 2021	eukar.ehu
	Day 6, 7 & 8	26 novembre 2021	eukar.ehu
	Term of References	5 mai 2021	Pierre DIAZ
	ADDITOOL Ejemplo presentacion WP3.pptx	29 septembre 2021	Pierre DIAZ
	Training Module structure.docx	29 septembre 2021	Pierre DIAZ
	WP3 - Training Course Content.xlsx	16 février	Fábio Jorge Pereira...

In any case, each entity was free to adapt the planning and modify the scheduling, depending on the availability of the workshops, time slots,...

3. Training Module organization

Once the design and the content of the course was available, a schedule was proposed for the different partners that participated in the activity. The courses started on February 2022 and finishes on June 2022. An additional course (not planned in the proposal) was carried out during January 2023. The following list shows the detailed dates and sites of the training modules.



ORDER NR.	PARTNER	DATES
1st Training	ENIT	January 24 th to February 04 th 2022
2nd Training	ESTIA	March 07 th to March 18 th 2022
3rd Training	FADA CATEC	May 23 rd to June 2 nd 2022
4th Training	IPLEIRIA	May 2 nd to May 13 th 2022
5th Training	UPV/EHU	June 6 th to June 16 th 2022
6th Training	ENIT	January 16 th to January 20 th 2023

In total, 60 students were trained during 2 weeks, mainly last year engineers and PhD researchers, but also people coming from companies.

Regarding to the evaluation, an open questionnaire has been uploaded for the students to obtain information and opinion about the modules.

Questionnaire : Evaluation of the Training pilot

This questionnaire is for the evaluation of the Educational pilot realized by the consortium of ADDITool. It concerns all the Educational pilots of the project. We thank you to select the pilot you attended and to be as exhaustive as possible on your answers.

Name : (facultative)

Tu respuesta

What module did you attend?

☐ ENIT
☐ ESTIA
☐ FADA CATEC
☐ IPLEIRIA
☐ UPV/EHU

Objectives and results of the prestation : (0 : Totally disagree, 5 : Totally agree)

	0	1	2	3	4	5
Your goals and expectations have been understood and taken into account	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The results of the module are in line with your expectations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>


Comments :

Tu respuesta

Quality of the prestation : (0 : Totally disagree, 5 : Totally agree)


	0	1	2	3	4	5
The contents are adapted and pertinent.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The time of the realization of the prestation were enough.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

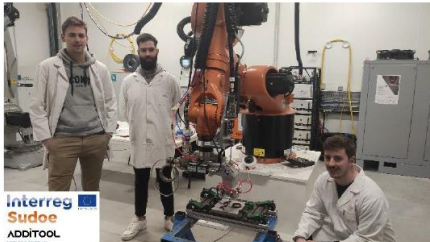
3.1. First training: ENIT (January 24th to February 04th 2022)


Place:	École Nationale d'Ingénieurs de Tarbes – ENIT								
Dates of the course:	From January 24th to February 04th 2022								
Number of students:	12 students								
Training & Visits:	Training on both study and research facilities (LGP and CRTCI of ENIT) Visit of ESTIA – Addimadour platform and to Lynxter company								
Short description:	24/01/2022	25/01/2022	26/01/2022	27/01/2022	28/01/2022	31/01/2022	1/02/2022	2/02/2022	3/02/2022
	Introduction to the tooling sector (J.Alexis) CRTCI 1	Design rules for mam technologies & manufacturing method (Y. Balcaen) CRTCI 1	MAM for tooling (M. Mokhtari) CRTCI 1	Programming of trajectories (M. Benoussaad) Salle pédagogie active	Visit of associate partners (ESTIA)	Topology optimisation (A.Vezarian) CRTCI 1	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.
	Introduction to the tooling sector (V. Nassiet) CRTCI 1	Design rules for mam technologies & manufacturing method (Y. Balcaen) CRTCI 1	MAM for tooling (M. Mokhtari) CRTCI 1	Programming of trajectories (M. Benoussaad) Salle pédagogie active	Visit of associate partners (ESTIA)	Topology optimisation (L.Arnaud) CRTCI 1	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.	MAM for tooling (practical works) (A.Ayed) CRTCI 1 + LABO.
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	4 days of lectures				↑	4 days of practical works			
	1 day of partners visit								
Photos:									

3.2. Second training: ESTIA (March 07th to March 18th 2022)





Place:	Ecole Supérieure des Technologies - ESTIA			
Dates of the course:	From March 07th to March 18th 2022			
Number of students:	10 students			
Training & Visits:	Training on Addimadour platform			
Short description:	Jour		Nom du module	Nom intervenant
	Lundi 07/03/22	9h - 12h30	MODULE 1_01 Introduction_notes	Pierre DIAZ
			MODULE 1_02 Glass Moulds	
			MODULE 1_03 METAL_Fforming_Tools	
			MODULE 1_04 Molds For Plastics_notes	
			MODULE 1_05_Intro_Die_Casting_Moulds	
		14h - 18h	Introduction Procédés Fabrication Additive + Visite	
	Mardi 08/03/22	8h30 - 11h	MODULE 2_01 Material for tooling and choice criteria	Pierre MICHAUD
			MODULE 2_02 AM Raw material powder	
			MODULE 2_03 AM Raw material Wire	
		14h - 16h	MODULE 2_06 Metallurgy Introduction	
			MODULE 3_06 AM Post-processing	
		16h - 18h	MODULE 3_01 Design Rules PBF Laser	Pierre DIAZ
	Mercredi 09/03/22	9h - 18h	MODULE 3_02 Design Rules Binder Jetting	Pierre DIAZ
			MODULE 3_03 Design Rules WIRE Arc & Laser	
			MODULE 3_04 Design Rules_FFF Metal Charged	
			MODULE 3_05 Design_Rules_DED Powder Laser	
	Jeudi 10/03/22	9h - 18h	MODULE 4_01 Topology Optimization	Pierre DIAZ
	Vendredi 11/03/22	9h - 12h30	MODULE 5_02 Hybrid Machine Tools	Fabien POULHAON ou Valentin PEIGNE
MODULE 5_03 DED Powder Programming			Fabien POULHAON	
14h - 18h		MODULE 5_04 LPBF Programming		
		MODULE 5_04 Programming_DED_Wire	ADAXIS	
Lundi 14/03/22	9h - 12h30	ADDITool_ENIT_Characterization_and_metalurgy V4	Pierre MICHAUD & Fabien POULHAON	
	14h - 14h30	MODULE 6_05 Monitoring_digital twin		
	14h30 - 18h	TP Lynxter 2h // Assignment Optim Topo 2h 2 groupes	Pierre DIAZ	
Mardi 15/03/22	9h - 18h	TP WAAM Groupe 1	Anais DOMERGUE	
		TP WLAM Groupe 2	Pierre DIAZ	
		TP BeAM Groupe 3	Valentin PEIGNE	
Mercredi 16/03/22	9h - 18h	TP WAAM Groupe 3	Anais DOMERGUE	
		TP WLAM Groupe 1	Pierre DIAZ	
		TP BeAM Groupe 2	Valentin PEIGNE	
Jeudi 17/03/22	9h - 18h	TP WAAM Groupe 2	Anais DOMERGUE	
		TP WLAM Groupe 3	Pierre DIAZ	
		TP BeAM Groupe 1	Valentin PEIGNE	
Vendredi 18/03/22	9h - 18h	Visite LAUAK et SOMOCAP	Pierre DIAZ	









3.3. Third training: FADA - CATEC (May 23rd to June 2nd 2022)

Place:	FADA - CATEC																													
Dates of the course:	From May 23rd to June 2nd 2022																													
Number of students:	14 students																													
Training & Visits:	Training on CATEC Facilities Visit to ARUS																													
Short description :	<table><thead><tr><th>Day</th><th>Content</th><th>Lecturers</th></tr></thead><tbody><tr><td>Day 1</td><td>MODULE 1 - Introduction and visit to CATEC</td><td>Carlos Galleguillos/ Antonio Perrián</td></tr><tr><td>Day 2</td><td>MODULE 2 - Materials</td><td>Álvaro Nieto/Ignacio González-Barba</td></tr><tr><td>Day 3</td><td>MODULE 3- Design rules</td><td>Daniel Hervás</td></tr><tr><td>Day 4</td><td>MODULE 4 - Topology optimization</td><td>Jorge Sogorb/Pablo Gómez</td></tr><tr><td>Day 5</td><td>MODULE 5 - AM programming</td><td>Javier Santaolaya</td></tr><tr><td>Day 6</td><td>MODULE 6— Quality Assurance of AM components</td><td>Carlos Galleguillos</td></tr><tr><td>Day 7 and 8</td><td>Practical exercises-labs</td><td></td></tr><tr><td>Day 9</td><td>Visit to ARUS</td><td></td></tr></tbody></table>			Day	Content	Lecturers	Day 1	MODULE 1 - Introduction and visit to CATEC	Carlos Galleguillos/ Antonio Perrián	Day 2	MODULE 2 - Materials	Álvaro Nieto/Ignacio González-Barba	Day 3	MODULE 3- Design rules	Daniel Hervás	Day 4	MODULE 4 - Topology optimization	Jorge Sogorb/Pablo Gómez	Day 5	MODULE 5 - AM programming	Javier Santaolaya	Day 6	MODULE 6— Quality Assurance of AM components	Carlos Galleguillos	Day 7 and 8	Practical exercises-labs		Day 9	Visit to ARUS	
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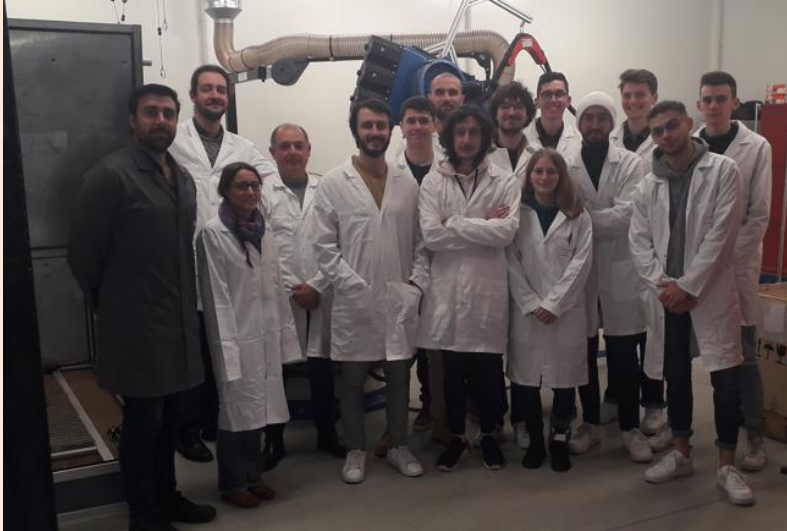
3.4. Fourth training: IPLEIRIA (July 14th to July 22nd 2022)

Place:	IPLEIRIA																																																																																																																																																																																																																																																																																						
Dates of the course:	From July 14th to July 22nd 2022																																																																																																																																																																																																																																																																																						
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3.5. Fifth training: UPV/EHU (June 6th to June 16th 2022)

Place:	UPV/EHU																																																																				
Dates of the course:	From June 6th to June 16th 2022																																																																				
Number of students:	11 students																																																																				
Training & Visits:	Training on Faculty of Engineering and CFAA (UPV/EHU) Visit to LORTEK (Topology MODULE) and BIEMH'22																																																																				
Short description :	<div><div><div></div><div></div><div></div></div><table><thead><tr><th></th><th>Lunes 6 de junio</th><th>Martes 7 de junio</th><th>Miércoles 8 de junio</th><th>Jueves 9 de junio</th><th>Viernes 10 de junio</th></tr></thead><tbody><tr><td>9:00-9:30</td><td>AulaMH T1 – Introducción Sector Molde</td><td>AulaMH T4 – Intro AM T5 – Mercado de AM T6 – Metalurgia</td><td rowspan="3">LORTEK Optimización topológica Práctica de Optimización topológica VISITA LORTEK</td><td>AulaMH T1 – Intro. Máquinas T1.5 –Maq Hta LPBF y DED</td><td rowspan="3">AULA AIMS - CFAA T4 – Programación LPBF VISITA CFAA- Aula AIMS</td></tr><tr><td>9:30-10:00</td><td></td><td></td><td></td></tr><tr><td>10:00-10:30</td><td>AulaMH T2 – Metal Forming T3 – Plastic Moulds</td><td></td><td></td></tr><tr><td>10:30-11:00</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11:00-11:30</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11:30-12:00</td><td>AulaMH T1 – Materiales Molde T2 – Fabricación Polvo T3 –Hilo para AM</td><td>AulaMH Práctica de ANSYS Workbench</td><td></td><td>AulaMH T2 – Máq. Híbridas T2.5 – Monitorización</td><td></td></tr><tr><td>12:00-12:30</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>12:30-13:00</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>14:30-15:00</td><td rowspan="4">Taller EIB Práctica de Materiales de aporte</td><td>AulaMH T1 – Design rules PBF T2 – Design rules BJ</td><td rowspan="4">BEC VISITA BIEMH y Addit3D</td><td rowspan="4">AulaMH - Taller Práctica de NX – Laser DED Aporte con Monitorización</td><td rowspan="4"></td></tr><tr><td>15:00-15:30</td><td>AulaMH T3 – Design rules WAAM T4 – Design Rules FFF</td></tr><tr><td>15:30-16:00</td><td>AulaMH T5 – Design Rules L- DED T6 – Postprocessing</td></tr><tr><td>16:00-16:30</td><td></td></tr><tr><td>16:30-17:00</td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table></div>		Lunes 6 de junio	Martes 7 de junio	Miércoles 8 de junio	Jueves 9 de junio	Viernes 10 de junio	9:00-9:30	AulaMH T1 – Introducción Sector Molde	AulaMH T4 – Intro AM T5 – Mercado de AM T6 – Metalurgia	LORTEK Optimización topológica Práctica de Optimización topológica VISITA LORTEK	AulaMH T1 – Intro. Máquinas T1.5 –Maq Hta LPBF y DED	AULA AIMS - CFAA T4 – Programación LPBF VISITA CFAA- Aula AIMS	9:30-10:00				10:00-10:30	AulaMH T2 – Metal Forming T3 – Plastic Moulds			10:30-11:00						11:00-11:30						11:30-12:00	AulaMH T1 – Materiales Molde T2 – Fabricación Polvo T3 –Hilo para AM	AulaMH Práctica de ANSYS Workbench		AulaMH T2 – Máq. Híbridas T2.5 – Monitorización		12:00-12:30						12:30-13:00						14:30-15:00	Taller EIB Práctica de Materiales de aporte	AulaMH T1 – Design rules PBF T2 – Design rules BJ	BEC VISITA BIEMH y Addit3D	AulaMH - Taller Práctica de NX – Laser DED Aporte con Monitorización		15:00-15:30	AulaMH T3 – Design rules WAAM T4 – Design Rules FFF	15:30-16:00	AulaMH T5 – Design Rules L- DED T6 – Postprocessing	16:00-16:30		16:30-17:00					
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3.6. Sixth training: ENIT (January 16th to January 20th 2023)

Place:	École Nationale d'Ingénieurs de Tarbes – ENIT
Dates of the course:	From January 16 th to January 20 th 2023
Number of students:	12 students
Training & Visits:	Training on both study and research facilities (LGP and CRTCI of ENIT) Visit of ESTIA – Addimadour platform and to Lynxter company
Short description:	Not planned initially. 2 nd course at ENIT. 2 days lecture and 2 days experimental classes 1 day visit on Addimadour platform (ESTIA): presentation of AM equipment's
Photos:	

4. Evaluation results

In the following section, the results of the evaluation questionnaire are presented. The results are based on the answers that students have chosen after the finishing of the module. The results are presented for a general overview, but they can be analysed individually for each training module or focusing on determined questions.

4.1. Questionnaire design

The questionnaire was designed and uploaded using Google Forms tool. Since all the students have a Google account, 100% of potential answers were available.

The form was designed with the double objective of getting information but with minimum effort. Therefore, each student could finish the questionnaire in less than 3 minutes.

Some examples of questions and format are presented below.

<p>Objectives and results of the prestation : (0 : Totally disagree, 5 : Totally agree)</p> <p>0 1 2 3 4 5</p> <p>Your goals and expectations have been understood and taken into account</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>The results of the module are in line with your expectations</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p>Quality of the prestation : (0 : Totally disagree, 5 : Totally agree)</p> <p>0 1 2 3 4 5</p> <p>The contents are adapted and pertinent.</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>The time of the realization of the prestation were enough.</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>The deliverables are satisfying</p> <p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>
<p>Comments :</p> <p>Tu respuesta</p>	<p>Comments :</p> <p>Tu respuesta</p>

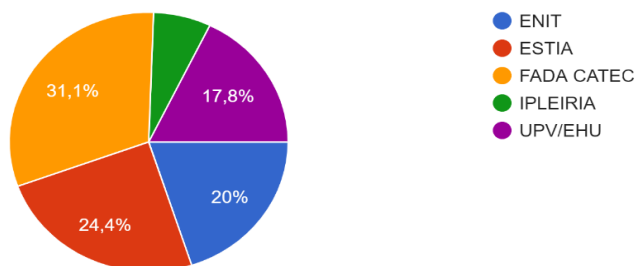
<p>How do you rate your level on MAM before the Training module?</p> <p><input type="radio"/> No experience</p> <p><input type="radio"/> Basic experience</p> <p><input type="radio"/> Good experience</p> <p><input type="radio"/> Expert</p>	<p>Do you recommend this Training Module?</p> <p><input type="radio"/> YES</p> <p><input type="radio"/> NO</p>
<p>How do you rate your level on MAM after the Training module?</p> <p><input type="radio"/> No experience</p> <p><input type="radio"/> Basic experience</p> <p><input type="radio"/> Good experience</p> <p><input type="radio"/> Expert</p>	<p>Suggestion(s) to improve this module :</p> <p>Tu respuesta</p>
	<p>Free comments and appreciation :</p> <p>Tu respuesta</p>

4.2. Evaluation results

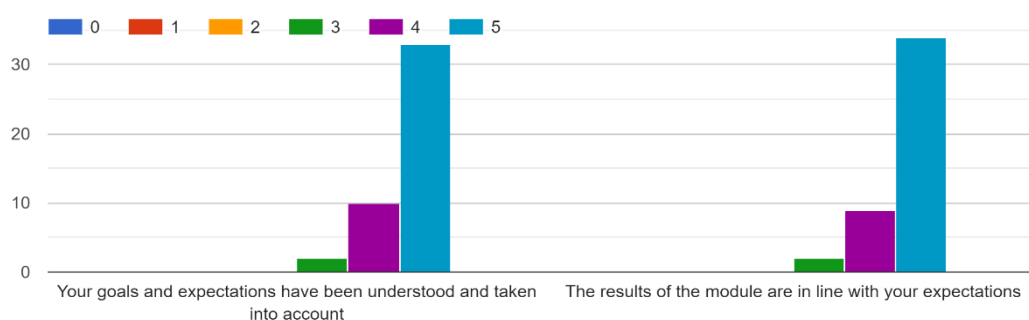
The results of the course evaluation are shown below.

What module did you attend?

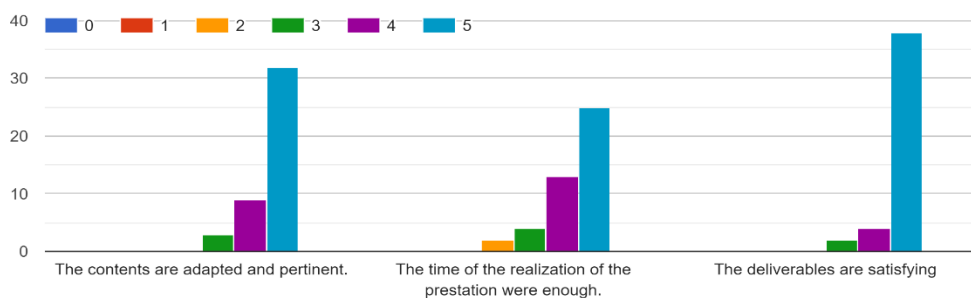
45 réponses



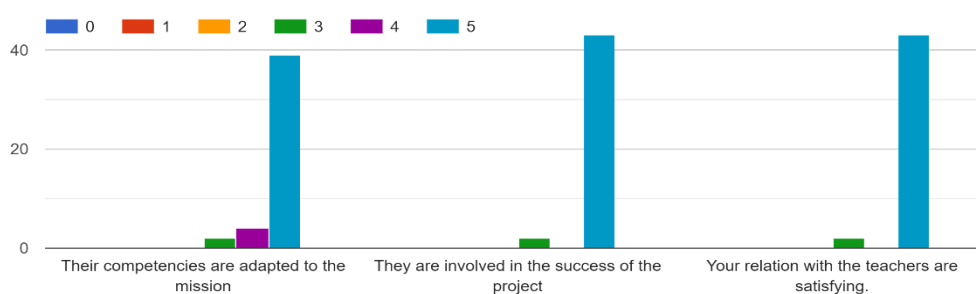
Objectives and results of the prestation : (0 : Totally disagree, 5 : Totally agree)



Quality of the prestation : (0 : Totally disagree, 5 : Totally agree)

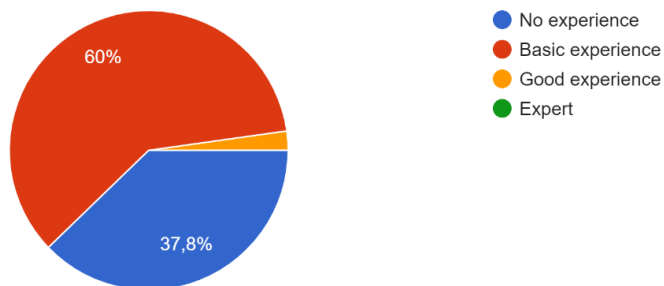


Satisfaction with teachers : (0 : Totally disagree, 5 : Totally agree)



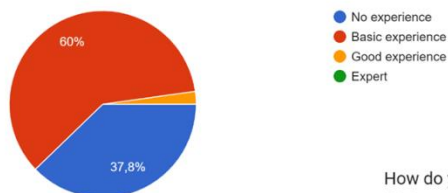
How do you rate your level on MAM before the Training module?

45 réponses



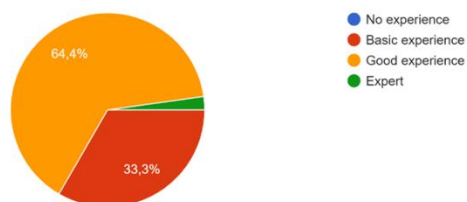
How do you rate your level on MAM before the Training module?

45 réponses



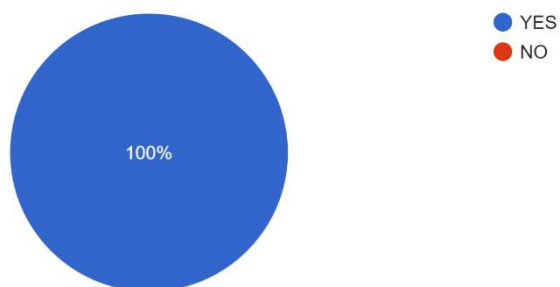
How do you rate your level on MAM after the Training module?

45 réponses



Do you recommend this Training Module?

45 réponses



5. Conclusions

The "Learning" activity of the ADDITool project has concluded with results that exceed initial expectations. First of all, more than 60 people have been trained in MAM technologies, which will help companies to adopt these technologies more easily and gradually. On the other hand, knowledge and experience has been shared among the different project partners, to obtain an advanced training course on MAM technologies that has been of high interest to students.

In addition, there have been visits and activities added to the course itself, which has enriched both the students and the people who have organized and taught the courses.

A final evaluation has concluded that a very efficient use of resources has been made, since different partners with different teams and specialties have been involved. Thus, each partner has developed a section of the course in which it was specialized, adding up to a set of documents and practices of great value for the students. It has been concluded that obtaining this result by a single partner would have been extremely complex and expensive.

The course has been given in 5 different centres with 6 editions (one of them not foreseen at the beginning of the project) and in all of them there has been a high level of interest from the participating students. The results of the surveys agree on the quality and the degree of the capacitation.

In summary, thanks to the ADDITool project, 60 people have been trained over the course of a year to help integrate additive manufacturing technologies in companies. In addition, the design and development of the course has served to create collaborative links between partners and associate partners.

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