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O1-A3:

Definition of training path and methodologies - *revised version*

& A4: Joint Curriculum Validation

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1	30/11/2021	Preliminary draft	STP
2	3/12/2021	Meeting discussion included	STP
3	20/12/2021	e-mail comments included	STP
4	07/02/2022	TPM discussion included	STP
5	21/11/2022	Revised version	STP

This document has been upgraded in November 2022, to reflect the renewed analysis following the compilation of the information during the L/T/T activity and the additional budget reallocated to IO1 activities due to Covid-19 related cancelation of transnational meetings in the initial phase of the project implementation.

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Industry 4.0 takes the emphasis on digital technology with the help of interconnectivity through the Internet of Things (IoT), access to real-time data, and the introduction of cyber-physical systems. It offers a comprehensive and interlinked, one can say a holistic, approach to manufacturing, connecting the physical with digital. This allows for better collaboration and access across departments, partners, vendors, product, and people, thus empowering business owners to better control and understand their business venture, allowing them to leverage instant data to boost productivity, improve processes, and drive growth.

Image 1: Bionic SME (by STP)
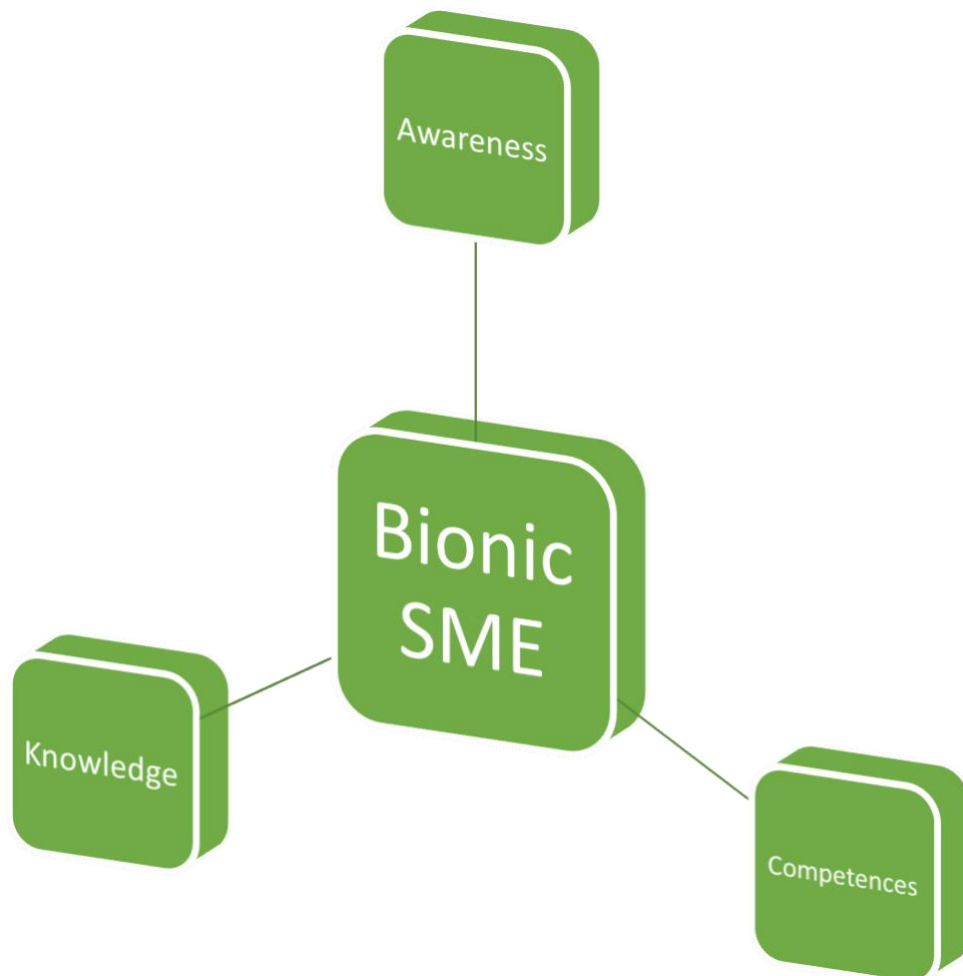
2. Learning outputs

Within IO1_A2 it was defined that the learning outputs must provide the following knowledge, skills and competencies to meet the needs:

Image 2: The overview of identified needs (by STP)
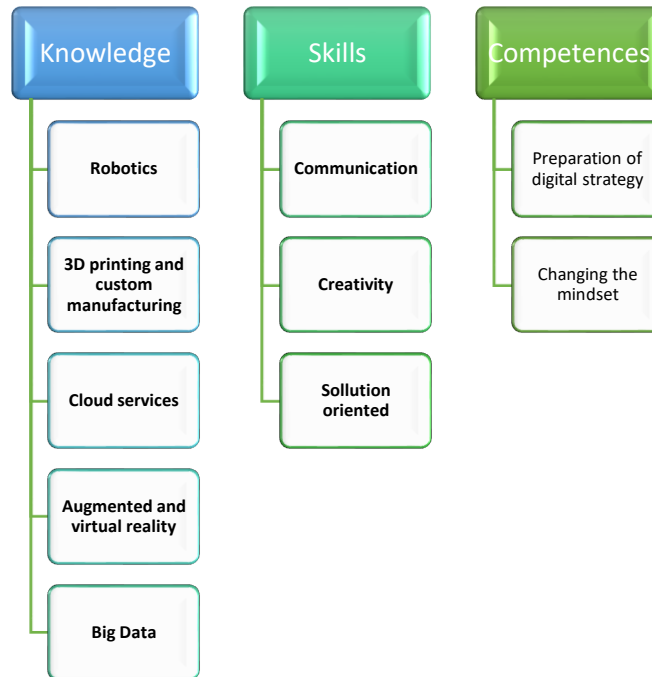
2.1. Target groups

Project GIST defined the target groups, for which the learning courses will be developed. These are also the three target groups for which the questionnaires were developed and the analysis (the Key Study IO1-A1) was made.

The following three groups are
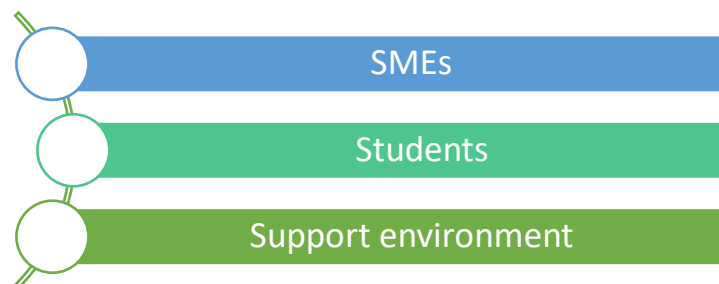
Some aspects of learning are the same for all three groups, while other aspects are specific for a particular group – therefore a breakdown of each specific

learning outcome will be prepared.

Before thematic learning process, however, each participant will receive a guideline for self-learning in order to learn how to learn online and to self-assess their level of readiness, and more importantly, engagement in the course.

2.2. Course outcome

Upon completion of the course the participant will become a facilitator, who will be empowered to elucidate participants' existing knowledge, prepare pertinent, meaningful training material, and steer discussions of implementing the following technologies: Robotics, 3D printing and custom manufacturing, Cloud services, Augmented and virtual reality, and Big Data.

The facilitator will meet the following requirements:
- Competences in preparation of digital strategies,
- Competences to expand the mindset of company management,
- Base knowledge about technologies considered to be the drivers of Industry 4.0, with special emphasis on Robotics, 3D printing and custom manufacturing, Cloud services, Augmented and virtual reality, and Big Data.
- Creative and solution-oriented mindset.
- Potent verbal and written communication skills.

With the completion of the course the facilitator will be able to take over the following responsibilities:
- Highlighting needs pertaining to capacity development.
- Perceiving which requirements are amenable to facilitation.
- Pinpointing existing programs or formulating bespoke courses for use.
- Encouraging respect for ideas voiced during facilitation.
- Steering conversations about the learning material.
- Extracting varied insights from participants.
- Administering and reviewing progress on assessments.

The learning outcomes of the GIST course will correspond to the EQF level 4 (as defined by Europass – see Table 1: EQF level 4).

Table 1: EQF level 4

KNOWLEDGE	SKILL	RESPONSIBILITY AND AUTHONOMY
Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

3. Learning units

In order to achieve the goal of providing knowledge, skills and competences for the participants of the GIST learning programme, individual learning units have been set up.

3.1. Division of learning units

However, as 3 target groups are identified, not all participants are required to undertake all 16 learning units. There will be 3 training courses provided, one for each targe group:

TC1 – Company BT facilitator
TC2 - General BT facilitator
TC3 – Facilitator for BT fostering
ALL – for all three profiles

Table 2: Training path definition

GIST TRAINING PATH DEFINITION		
Training Unit	UNITS	Included in training course
TU-1: I4.0 Technologies	LU1. What is bionic transformation	ALL
	LU2. Technological drivers of bionic transformation	TC2, TC3
	LU3. 3DP and custom manufacturing	TC1
	LU4. Robotics	TC1
	LU5. Cloud services	TC1
	LU6. Augmented and Virtual reality	TC1
	LU7. Big data	TC1
TU-2: Soft Skills for BT	LU8. Communication & Brainstorming	TC2, TC3
	LU9. Design & Strategic Thinking	TC1, TC2
	LU10. Collaboration & Decision making	TC3
TU-3: BT Management	LU11. System thinking	ALL
	LU12. BT support environment	TC2, TC3
	LU13. BT funding opportunities	TC1, TC3
TU-4: BT Case Studies	LU14. Best BT practices	TC2, TC3
	LU15. Making a bionic transition	TC1, TC2
TU-5: Company culture	LU16. Innovation Uptake	ALL
	LU17. Leadership	ALL
	LU18. Intercultural Mediation	ALL

3.2. Structure of learning units

The training resources for each of the learning units will follow the same structure:

⇒ 1 Power Point
⇒ 1 animated infographic with Genia.ly
⇒ 1 Animated video with PowToon
⇒ 1 Questions for participants

The exception to this structure is LU14, where only the PowerPoint presentation will be available.

In addition, the learning units will be translated into national languages of the partnership.

4. Training units of the training course

The entire training course is divided into 5 training units. TU 1-5 are thematic and are providing knowledge, skills and competences for the participants.

4.1. Training unit 1: I4.0 technologies

TU 1 will provide the participants the knowledge, skills and competences required to better understand the bionic transformation, the driving technologies behind the transformation, and specifically to gain more knowledge about the 5 technologies identified in the survey as the main drivers of bionic transformation.
This TU is foreseen for individual learning of participants, although they can communicate with each other in case they would like to share opinions on certain matters.

Table 3: Training unit 1

	Knowledge	Skills	Competences
LU1	Fundamental knowledge about bionic transformation	Distinguish the main steps of BT methodologies, identify specific barriers and impact.	Autonomous ability to develop a strategy for bionic transformation.
LU2	Overview of technologies that drive bionic transformation	Basic understanding of technologies and theoretical knowledge to present added value of technologies for SMEs.	Autonomous ability to present a roadmap for transformation of an SME by hypothetical implementation of any of these technologies.
LU3-7	Have knowledge about key i4.0 technologies identified: a) 3DP and custom manufacturing; b) Robotics; c) Cloud services; d) Augmented and virtual reality; e) Big data	Recognise potential for implementation of i4.0 technologies in SMEs to initiate bionic transformation.	Autonomous ability to present the benefits of implementing any or several of these technologies.
Method of learning	Providing textual explanations (supported by visualisations) based on which the content can be studied.	Combination of texts and infographics, with recorded audio material providing background knowledge for of I4.0 technologies.	Providing infographics video with recorded audio guidelines on how to prepare hypothetical examples.

Method of testing	A multiple answer online quiz, with single possible answer. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions are always the same).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).

4.2. Training unit 2: Soft Skills for Bionic Transformation

TU 2 will provide the participants the knowledge, skills and competences that will empower them to become the instigators of bionic transformation. The main focus of this TU is acquirement of knowledge, skill and competence set that can help change participant's own mindset.

Table 4: Training unit 2

	Knowledge	Skills	Competences
LU8	Understand the benefits of effective communication and pitching of BT benefits.	Explain the benefits derived from applying technologies i.40 to stakeholders.	Ability to pitch BT and instruct stakeholders on how it can benefit their businesses on different levels.
LU9	Have knowledge about entrepreneurial mindset, strategies of design thinking, strategy for digitalisation and methods of co-creation.	Ability to develop an entrepreneurial mindset and identify the most appropriate strategies of design thinking, strategy for digitalisation and methods of co-creation.	Autonomous ability to apply entrepreneurial mindset, strategies of design thinking, strategy for digitalisation and methods of co-creation for the formulation of innovative solutions in BT.
LU10	Have knowledge about models of collaboration to facilitate inter-companies team work and decision-making.	Ability to identify most appropriate models of collaboration.	Autonomous ability to organise and efficiently manage inter-companies team work.
Method of learning	Providing textual explanations (supported by visualisations) based on which the content can be studied.	Combination of texts and infographics, with recorded audio material providing background knowledge of soft skills for BT.	Providing infographics video with recorded audio guidelines on how to prepare hypothetical examples.
Method of testing	A multiple answer online quiz, with single possible answer. To pass a score of 80% or higher must be reached. Each candidate has	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3

	3 opportunities to pass (questions are always the same).	opportunities to pass (questions change each time).	opportunities to pass (questions change each time).

4.3. Training unit 3: Bionic Transformation Management

TU 3 will provide the participants the knowledge, skills and competences required to manage the processes connected to the bionic transformation of the company, including the financial aspects and connecting with other companies and stakeholders.

Table 5: Training unit 3

	Knowledge	Skills	Competences
LU11	Understand the benefits deriving from effective application of system-thinking.	Apply successful system-thinking approach.	Autonomous ability to carry out systematic analysis.
LU12	Have knowledge about available platforms for implementation of i4.0 technologies and bionic transformation.	Ability to identify most appropriate platforms for bionic transformation.	Independently conduct cross-sectorial and multi stakeholders' analysis by using BT platforms.
LU13	Have theoretical knowledge about EU funding programmes, schemes and relevant national entities.	Ability to identify appropriate financial incentives and funding opportunities on the EU level and relevant national entities.	Autonomous ability to inform about relevant financial opportunities and to evaluate outsourcing for legal and financial advice.
Method of learning	Providing textual explanations (supported by visualisations) based on which the content can be studied.	Combination of texts and infographics, with recorded audio material providing background knowledge about the management of bionic transformation.	Providing infographics video with recorded audio guidelines on how to prepare hypothetical examples.
Method of testing	A multiple answer online quiz, with single possible answer. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions are always the same).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).

4.4.Training unit 4: Bionic Transformation Case Study

TU 4 will provide practical cases of bionic transformation that were identified in the following countries: Germany, Spain and Belgium. The main focus of this TU is on analysis of own situation and applying a good practice example.

Table 6: Training unit 4

	Knowledge	Skills	Competences
LU14	Familiarisation with best practices collected from the project partner countries.	Ability to identify applied BT principles and methodologies.	Enhanced ability to autonomously plan BT projects based on real cases.
LU15	Preparation of an action plan that will result in the bionic transformation of a specific company.		
Method of learning	Providing textual explanations (supported by visualisations) based on which the content can be studied.	Combination of texts and infographics, with recorded audio material providing background knowledge of good practices.	Providing infographics video with recorded audio guidelines on how to prepare hypothetical examples based on the provide practices.
Method of testing	A multiple answer online quiz, with single possible answer. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions are always the same).	A multiple answer online quiz, with single or multiple correct answers on the logic of good practices. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).

4.5. Training unit 5: Company culture

This TU was additionally added, based on the L/T/T experience, where the presenters of best practices have emphasises the importance of Company Culture, which refers to the attitudes and behaviours of a company and its employees and manifests itself in the way people are interacting on three different levels: within the company, company to other companies, company to customers. As the survey report conducted within the GIST project showed, such competences are clearly lacking, therefore a training course dedicate to Company culture was added to the originally planned 4 training courses.

TU 5 will provide the participants with soft skills and competences required to manage the processes connected to the bionic transformation of the company. These skills and competences include the principles of innovation management, leadership, and company culture and how they reflect in the changes in the company.

	Knowledge	Skills	Competences
LU16	Understand the principles of innovation and innovation management, including the stages of innovation thinking.	Apply successful innovation-thinking approach.	Autonomous ability to carry out the innovation management process for innovation uptake.
LU17	Have knowledge about the competences and skills required for good leadership and understanding the impact of the leadership upon a company	Apply the soft skills of competent leadership in order to effectively create a positive impact in a company, especially during bionic transformation.	Independent analysis of the company structure and the opportunities for modification through the changed leadership model.
LU18	Understanding the multilayer impacts of a company culture on the staff, business partners and customers.	The ability to identify the current culture of a company, with identification of potential to change.	The ability to conduct intercultural mediation to overcome potential conflict situation within the company and in relation of the company to both business partners and customers.
Method of learning	Providing textual explanations (supported by visualisations) based on which the content can be studied.	Combination of texts and infographics, with recorded audio material providing background knowledge of good practices.	Providing infographics video with recorded audio guidelines on how to prepare hypothetical examples based on the provide practices.
Method of testing	A multiple answer online quiz, with single possible answer. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions are always the same).	A multiple answer online quiz, with single or multiple correct answers on the logic of good practices. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).	A multiple answer online quiz, with single or multiple correct answers. To pass a score of 80% or higher must be reached. Each candidate has 3 opportunities to pass (questions change each time).

4.6. Conclusion

Overall, the 18 learning units equal the total of 128 learning hours, which is an equivalent of 5,12 ECVET points.

For a detailed breakdown of learning hours and requirements for separate training courses see ANNEX I: Joint Curriculum.

5. Training course

Based on the 3 identified target groups, not all participants are required to undertake all 18 learning units. Based on the target group a participant belongs to, 3 different training courses will be provided, where the participant will achieve one of the 3 certificates:

Table 8: 3 types of BT facilitators

Company BT facilitator	General BT facilitator	Facilitator for BT fostering
A company expert, trained to facilitate BT within a specific company	A facilitator with an overview on how to implement bionic transformation in an unspecified environment.	A facilitator that is fostering BT by supporting companies in its implementation.

However, each participant should have the opportunity to complete the LU not included in a specific course, to complete the entirety of the GIST training, achieving 5,12 ECVET points and gaining a certificate of Bionic Transformation Facilitator.

5.1. Company BT facilitator

As the companies are the main target group that should aim for achieving the bionic transformation, this training course consists of most training hours = 84 hours of learning, which is the equivalent of 3,36 ECVET points.

5.2. General BT facilitator

The students, who are gaining their education, but are not yet employed or otherwise linked to a specific industry, are the second target group and will support the bionic transformation upon their employment. This training course consists of 82 hours of learning, which is an equivalent of 3,28 ECVET points.

5.3. Facilitator for BT fostering

As the support environment that is helping companies in various way is also a target group for fostering BT, the course developed for them consists of 90 hours of learning, which is the equivalent of 3,20 ECVET points.

6. Next steps

The training path defined in this document represents the joint curriculum for the GIST training of bionic transformation facilitator (see Annex 1).

6.1. Joint curriculum validation

According to the application form 30 stakeholders need to be involved in the activity. The partners contacted all the stakeholders who filled out the initial survey for activity IO-A1.

However, in accordance with the Learning Outcome Definition (IO-A2) which the partnership has accepted as a deliverable and it was agreed at the partnership online conference on December 2nd, the benchmark to reach was to receive 20% of the stakeholders to provide their feedback and the satisfaction rate must reach at least 80% (mark 4 on a scale from 1 – 5).

As seen in Table 9 and Table 10 below, the required target was reached.

Table 9: Number of validations by target group:

	Survey responses	Validation responses	In %
SMEs	30	8	26,7
STUDENTS	17	8	47,1
OTHER	24	9	37,5
TOTAL	71	25	35,2

Table 10: Satisfaction rate per learning unit:

	Average mark
LU1. What is bionic transformation	4,36
LU2. Technological drivers of bionic transformation	4,28
LU3. 3DP and custom manufacturing	4,36
LU4. Robotics	4,36

LU5. Cloud services	4,28
LU6. Augmented and Virtual reality	4,4
LU7. Big data	4,32
LU8. Communication & Brainstorming	4,12
LU9. Design & Strategic Thinking	4,32
LU10. Collaboration & Decision making	4,12
LU11. System thinking	4,2
LU12. BT support environment	4,04
LU13. BT funding opportunities	4,04
LU14. Best BT practices	4,08
LU15. Making a bionic transition	4,2

In addition to the 15 identified learning units the stakeholders have made comments about the need to include soft skills in the learning curriculum, especially on the topic of the innovation culture within the company.

These soft skills should be connected to the readiness of the company to follow and apply new technologies, to be able to introduce change in the company through positive communication and leadership, and to resolve potential misunderstandings within a company or broader through mediation.

Therefore, the following 3 learning units were developed in addition to cover the needs provided:

LU16. Innovation uptake

LU17. Leadership

LU18. Intercultural mediation

6.2. Distribution of content inputs

Furthermore, the partners divided among themselves the responsibility for the preparation of the concept of each of the learning units (as seen in Annex 1).

ANNEX I: Joint Curriculum

	GIST: BIONIC TRANSFORMATION FACILITATOR JOINT CURRICULUM					
Training Unit	UNITS	TC1 - ECVET	TC2 - ECVET	TC3 - ECVET	Learning Hours	Partner responsible for content
TU 1: I4.0 Technologies	LU1. What is bionic transformation	0,2	0,2	0,2	5	STP
	LU2. Technological drivers of bionic transformation		0,2	0,2	5	STP
	LU3. 3DP and custom manufacturing	0,24			6	CETEM
	LU4. Robotics	0,24			6	CETEM
	LU5. Cloud services	0,24			6	KIT
	LU6. Augmented and Virtual reality	0,24			6	CETEM
	LU7. Big data	0,24			6	KIT
TU 2: Soft Skulls for BT	LU8. Communication & Brainstorming		0,32	0,32	8	GLOBALNET
	LU9. Design & Strategic Thinking	0,32	0,32		8	IRMO
	LU10. Collaboration & Decision making			0,32	8	GLOBALNET
TU 3: BT Management	LU11. System thinking	0,32	0,32	0,32	8	KIT
	LU12. BT support environment		0,32	0,32	8	INNOVAWOOD
	LU13. BT funding opportunities	0,32		0,32	8	CETEM
TU 4: BT Case Studies	LU14. Best BT practices		0,6	0,6	15	All (each tries to identify cases in their country)
	LU15. Making a bionic transition	0,4	0,4		10	STP
TU 5: Company Culture	LU16. Innovation uptake	0,2	0,2	0,2	5	CETEM
	LU17. Leadership	0,2	0,2	0,2	5	IRMO
	LU18. Intercultural mediation	0,2	0,2	0,2	5	GLOBALNET
	TOTAL LEARNING HOURS:	84	82	80	128	
	TOTAL ECVET:	3,36	3,28	3,20	5,12	