Dipartimento di Pianificazione Design
Tecnologia dell'Architettura

Sapienza
Università di Roma

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

EHE·CMAP

Advanced Training on Energy Efficiency in Historic Buildings

CONFERENCE ON ENERGY EFFICIENCY IN HISTORIC HERITAGE

Organiser: IRENA-Istrian Regional Energy Agency
City library Labin, Rudarska 1, Labin

Arch.PhD. Maurizio Sibilla
29 june 2016

DIPARTIMENTO DI PIANIFICAZIONE DESIGN
TECNOLOGIA DELL'ARCHITETTURA

SAPIENZA
UNIVERSITÀ DI ROMA

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of the European Union

EH-CMAP (2014-2016)

Advanced Training on Energy Efficiency in Historic Heritage

Cooperation for innovation and the exchange of good practices, Strategic Partnership

Partner:

_IRENA - Istrian Regional Energy Agency Ltd. (HR)

_Patronato de la Alhambra y Generalife, (ES)

_Malta Intelligent Energy Management Agency (MT)

_Universidade do Algarve (PT)

_La Sapienza University of Rome

Working group

La Sapienza University of Rome, Departement PDTA (IT)

- prof. Eliana Cangelli, Project Manager

- prof. Serena Baiani, PhD. Maurizio Sibilla

- Cateriana Reccia, Michela Pascucci

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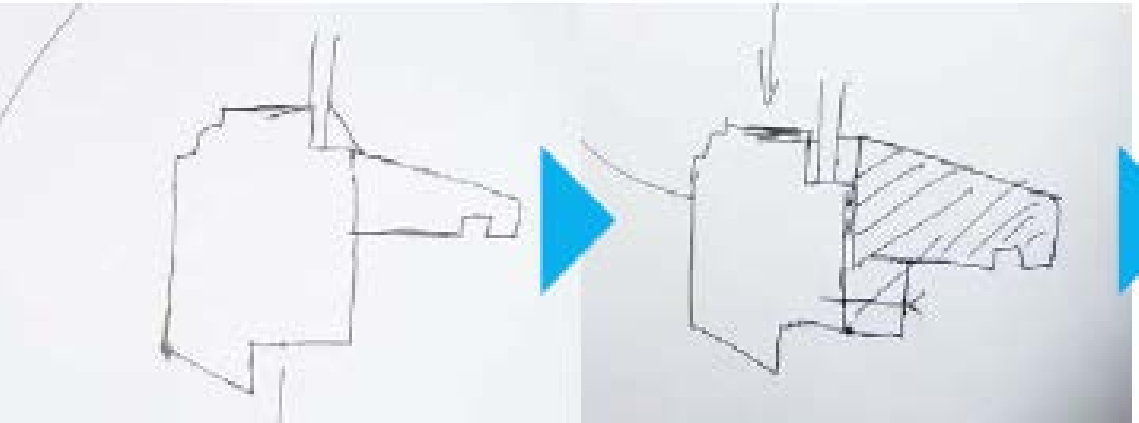
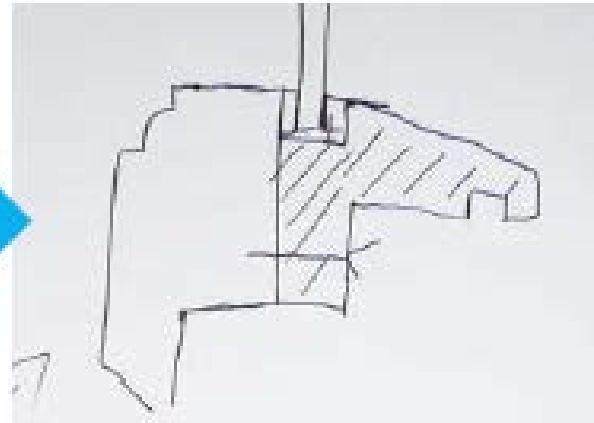
TO WORK WITHIN THE COMPLEXITY





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DEFICIENCIES WE HAVE TO FACE

i_ the incompleteness of systematic, theoretical and operational study relative to the problems of preservation and sustainability;

ii_the lack of programs dedicated to interdisciplinary training capable of facilitating learning and the capacity to transfer information from different disciplinary spheres;

iii_the insufficiency of tools capable of facilitating orientation, comprehension and modelling of complex themes.

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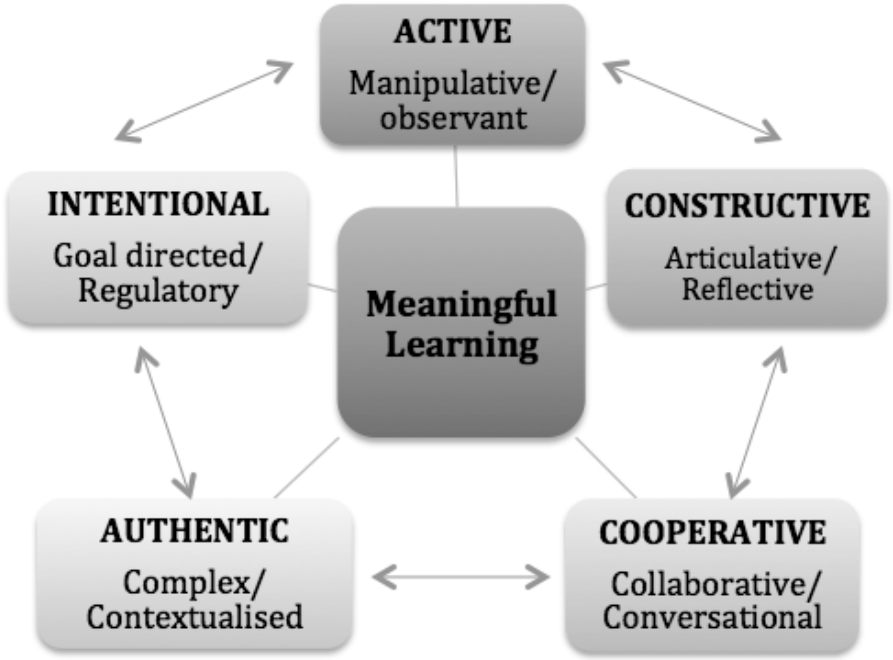
PURPOSE AND HYPOTHESIS

The project is founded on the hypothesis of systemizing the
activities of meaningful learning (Ausbel)

with
computer applications dedicated
to the elaboration of cognitive maps (Novak)

aimed at

developing the ability to manage the complexity
of the elevated interactions flows present in the project of energy efficiency
of historical buildings.



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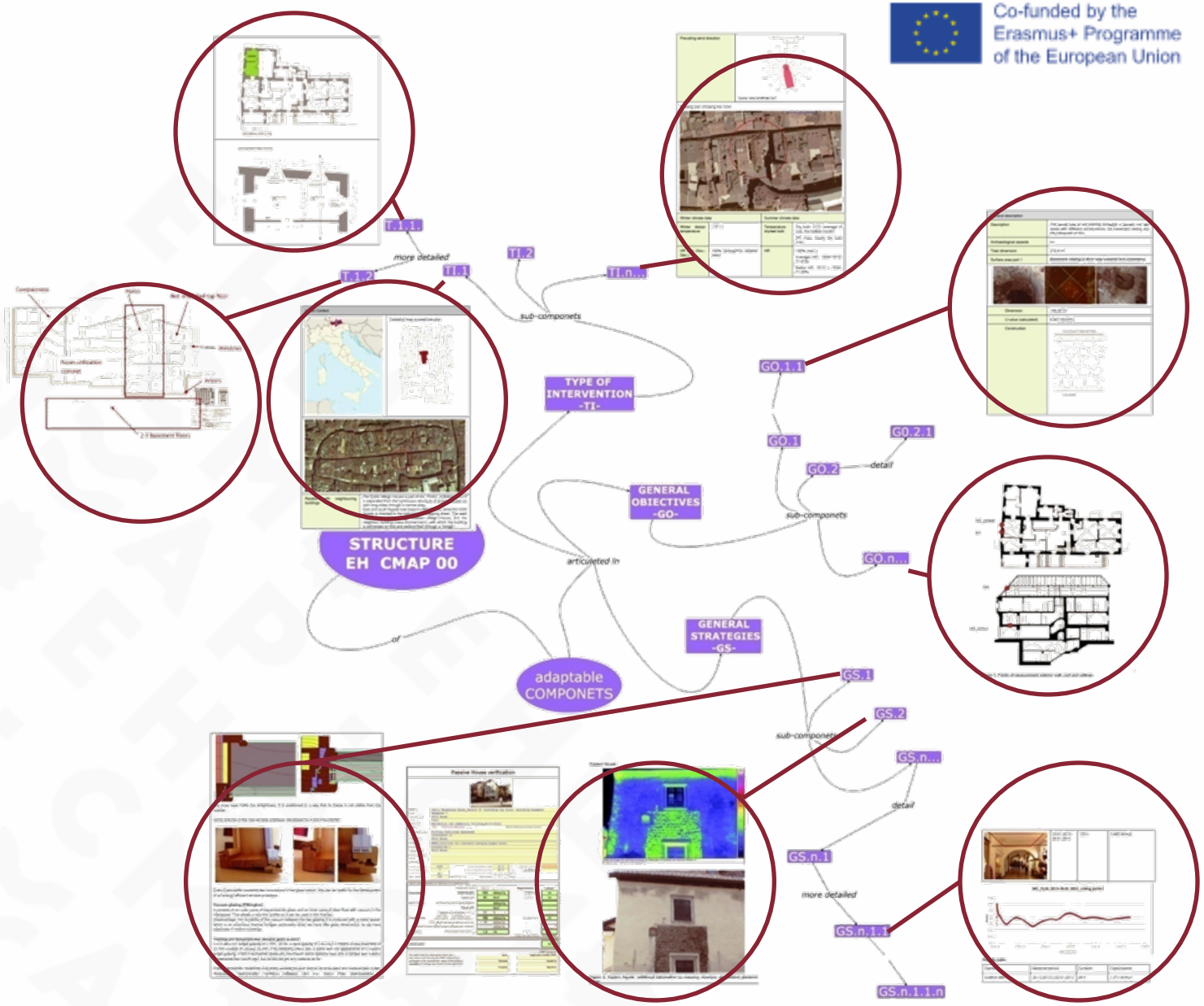
25 CASE STUDIES:

- GATHERING INFORMATION

- TRANSFER INFORMATION
FROM TEXTUAL FORM
TO MAP ONE



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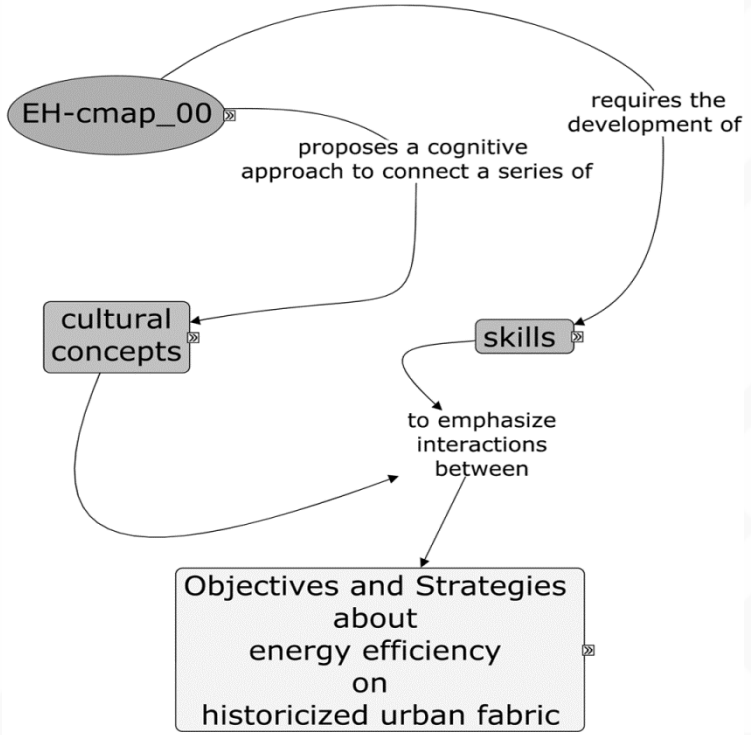
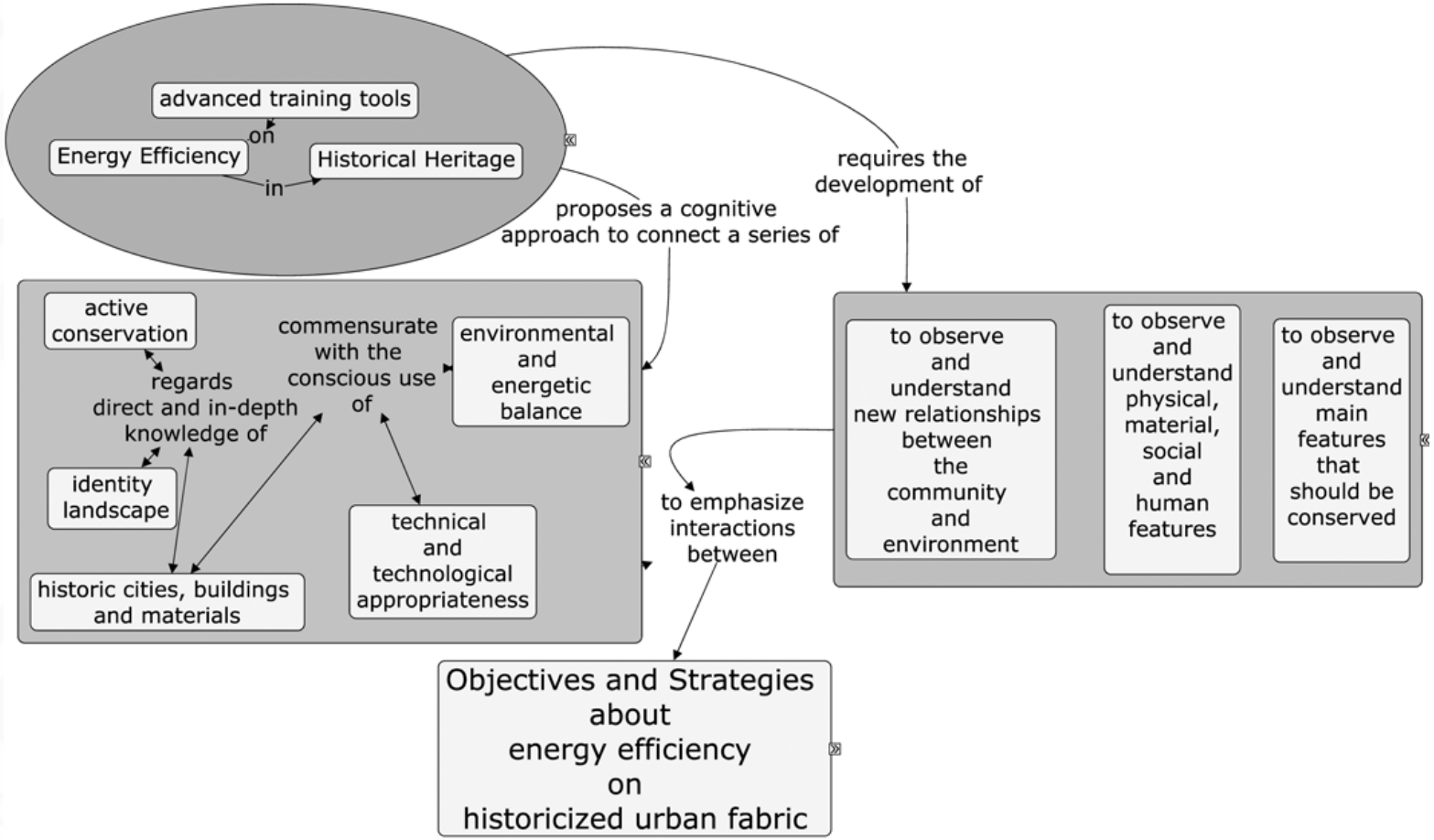
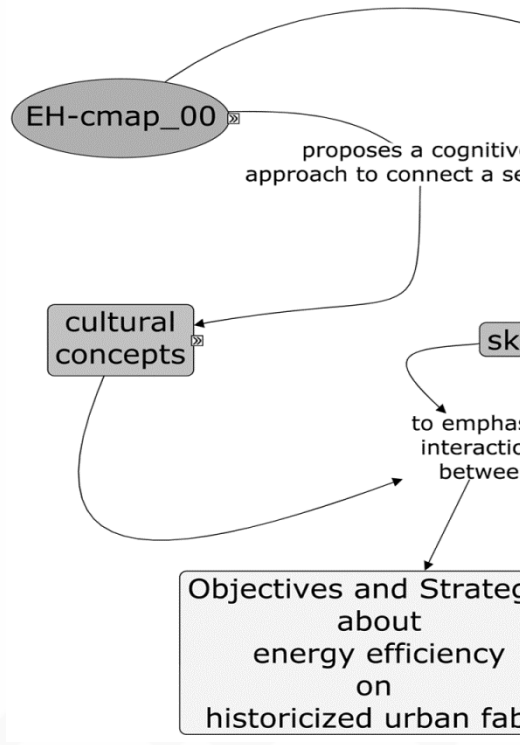
EH-CMAP_00:
A NEW LEARNING TOOL TO MANAGE THE COMPLEXITY






EH-cmap_00
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betwee
Objectives and Strateg
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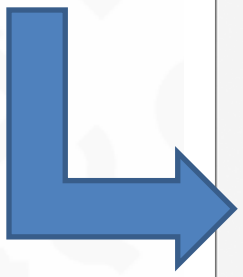
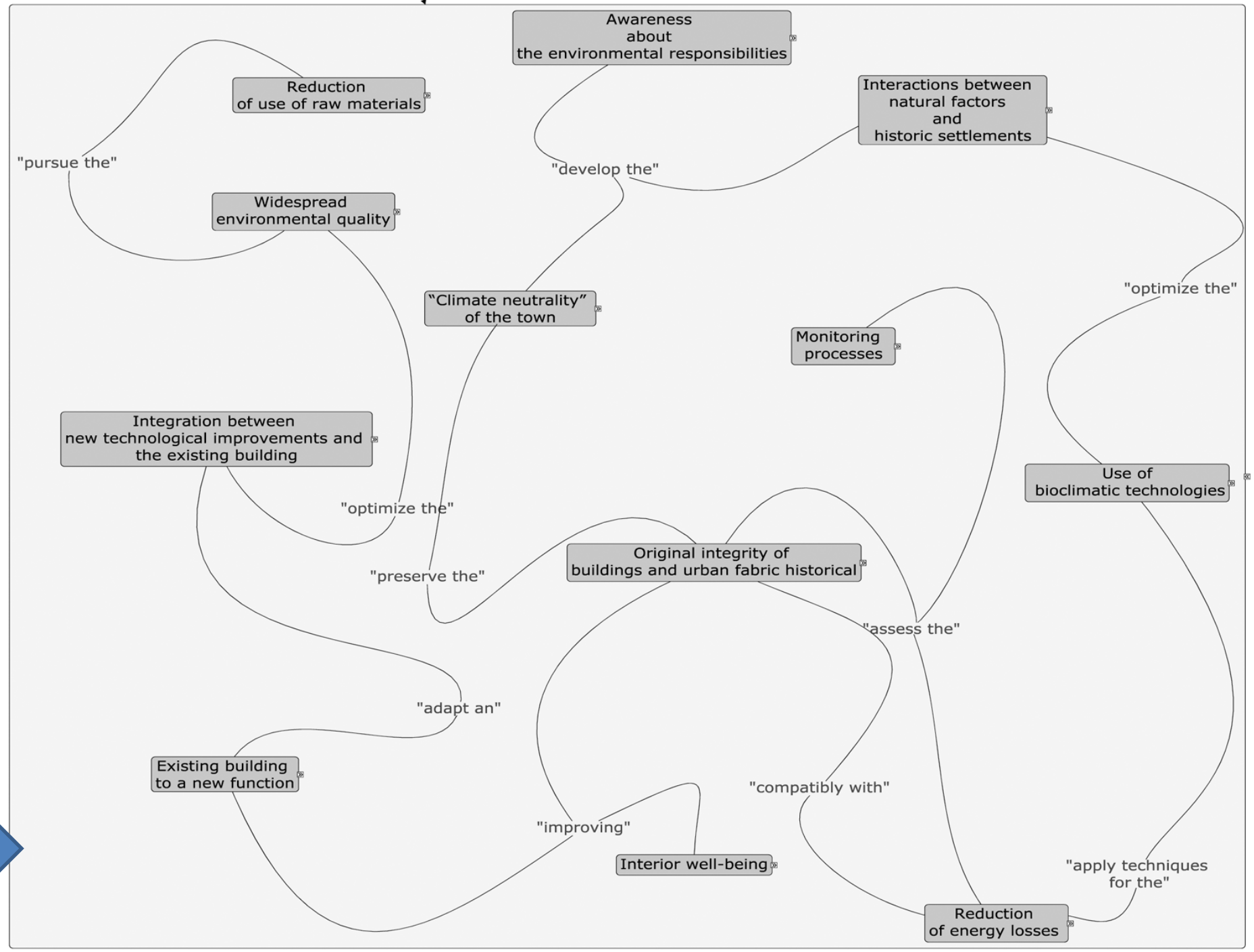
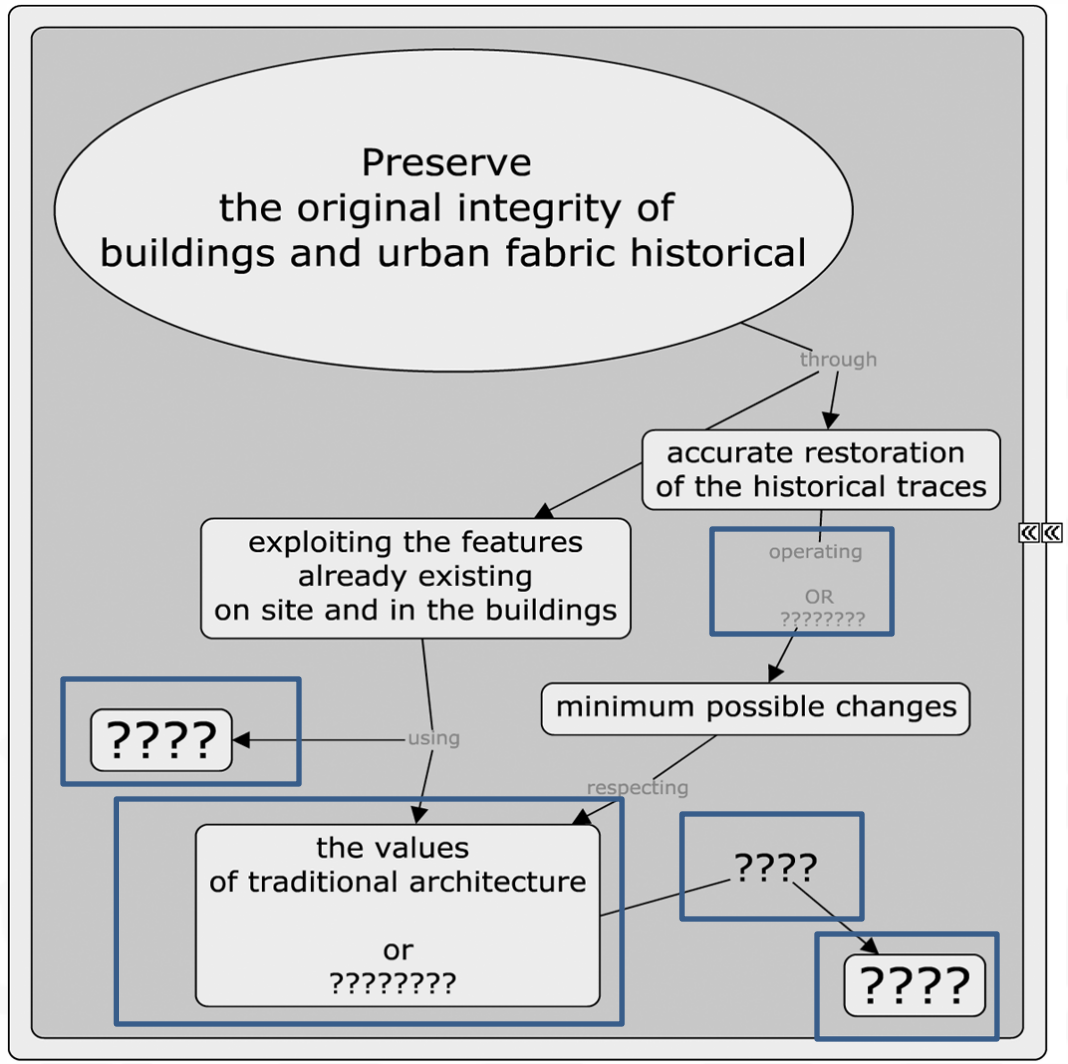
on
historicized urban fab




Awareness
about
the environmental responsibilities
Reduction
of use of raw materials
Interactions between
natural factors
and
historic settlements
"pursue the"
"develop the"
Widespread
environmental quality
"optimize the"
"Climate neutrality"
of the town
Monitoring
processes
Integration between
new technological improvements and
the existing building
Use of
bioclimatic technologies
"optimize the"
"preserve the"
Original integrity of
buildings and urban fabric historical
"assess the"
"adapt an"
Existing building
to a new function
"compatibly with"
"improving"
Interior well-being
"apply techniques
for the"
Reduction
of energy losses


Preserve
the original integrity of
buildings and urban fabric historical
through
accurate restoration
of the historical traces
exploiting the features
already existing
on site and in the buildings
operating
OR
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minimum possible changes
????
using
respecting
the values
of traditional architecture
or
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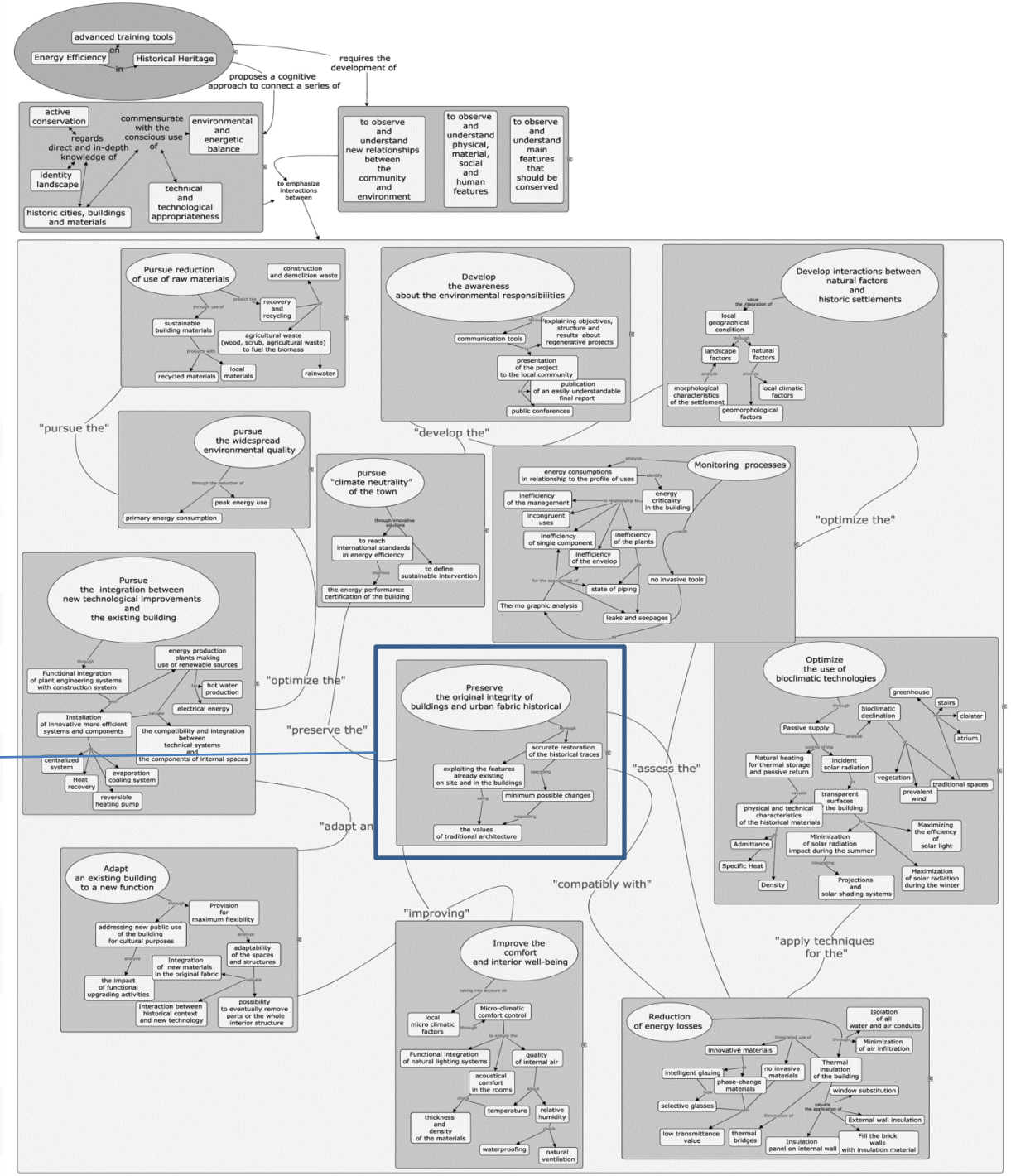
advanced training tools
on
Energy Efficiency
Historical Heritage
in
requires the development of
proposes a cognitive approach to connect a series of
active conservation
regards direct and in-depth knowledge of
identity landscape
historic cities, buildings and materials
commensurate with the conscious use of
environmental and energetic balance
technical and technological appropriateness
to emphasize interactions between
to observe and understand new relationships between the community and environment
to observe and understand physical, material, social and human features
to observe and understand main features that should be conserved
Pursue reduction of use of raw materials
construction and demolition waste
recovery and recycling
sustainable building materials
agricultural waste (wood, scrub, agricultural waste) to fuel the biomass
recycled materials
local materials
rainwater
Develop the awareness about the environmental responsibilities
communication tools
explaining objectives, structure and results about regenerative projects
presentation of the project to the local community
publication of an easily understandable final report
public conferences
Develop interactions between natural factors and historic settlements
local geographical condition
landscape factors
natural factors
morphological characteristics of the settlement
local climatic factors
geomorphological factors
"pursue the"
pursue the widespread environmental quality
peak energy use
primary energy consumption
pursue "climate neutrality" of the town
to reach international standards in energy efficiency
to define sustainable intervention
the energy performance certification of the building
"develop the"
Monitoring processes
energy consumptions in relationship to the profile of uses
inefficiency of the management
energy criticality in the building
incongruent uses
inefficiency of single component
inefficiency of the plants
inefficiency of the envelop
state of piping
no invasive tools
Thermo graphic analysis
leaks and seepages
"optimize the"
Pursue the integration between new technological improvements and the existing building
energy production plants making use of renewable sources
Functional integration of plant engineering systems with construction system
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Installation of innovative more efficient systems and components
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Heat recovery
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"assess the"
Optimize the use of bioclimatic technologies
greenhouse
stairs
bioclimatic declination
cloister
Passive supply
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Natural heating for thermal storage and passive return
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vegetation
traditional spaces
prevalent wind
transparent surfaces the building
physical and technical characteristics of the historical materials
Admittance
Minimization of solar radiation impact during the summer
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Density
Projections and solar shading systems
Maximization of solar radiation during the winter
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"compatibly with"
"apply techniques for the"
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Provision for maximum flexibility
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the impact of functional upgrading activities
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Improve the comfort and interior well-being
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Micro-climatic comfort control
Functional integration of natural lighting systems
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relative humidity
thickness and density of the materials
waterproofing
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Minimization of air infiltration
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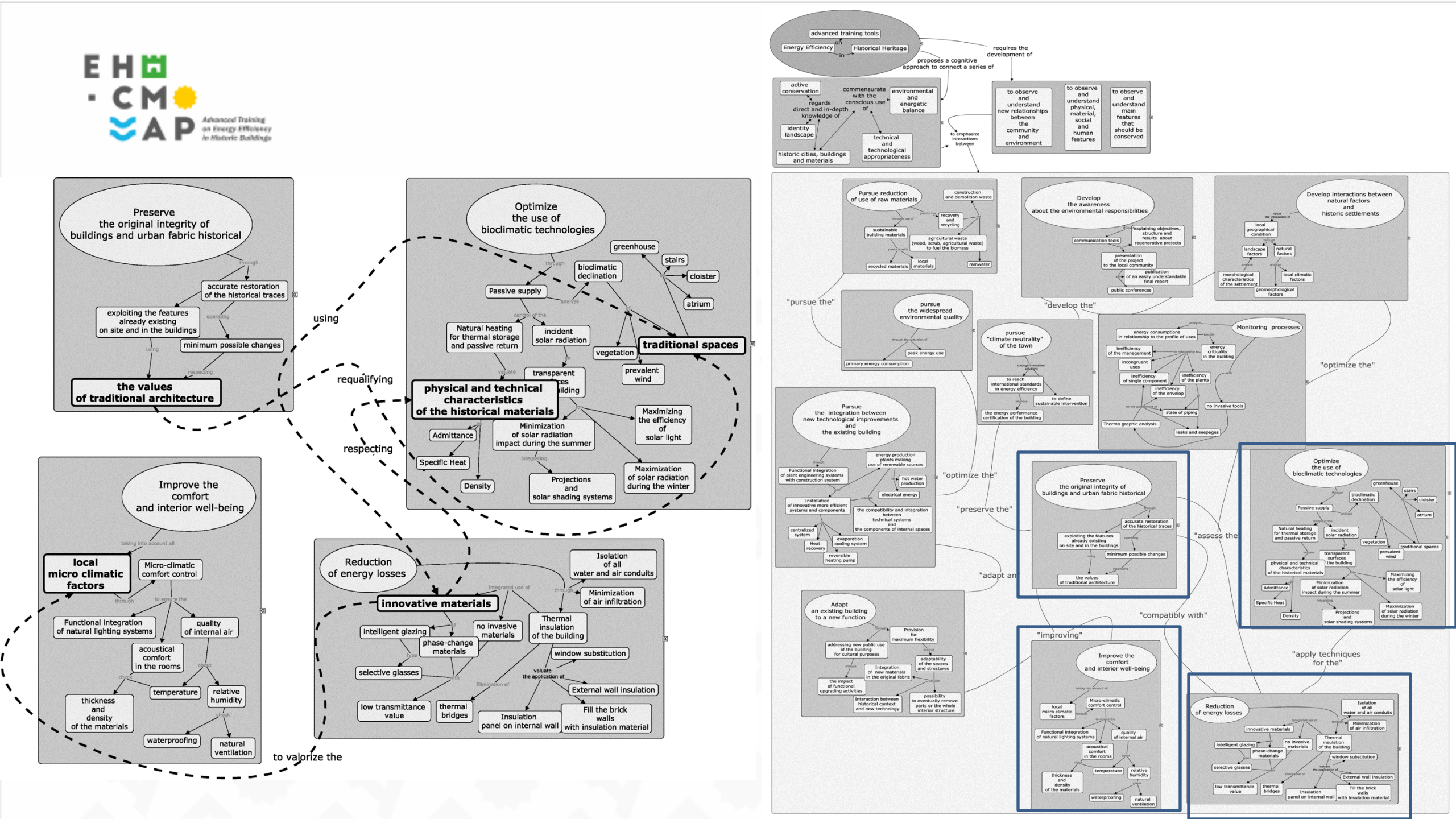
Thermal insulation of the building
intelligent glazing
no invasive materials
phase-change materials
window substitution
selective glasses
External wall insulation
low transmittance value
thermal bridges
Insulation panel on internal wall
Fill the brick walls with insulation material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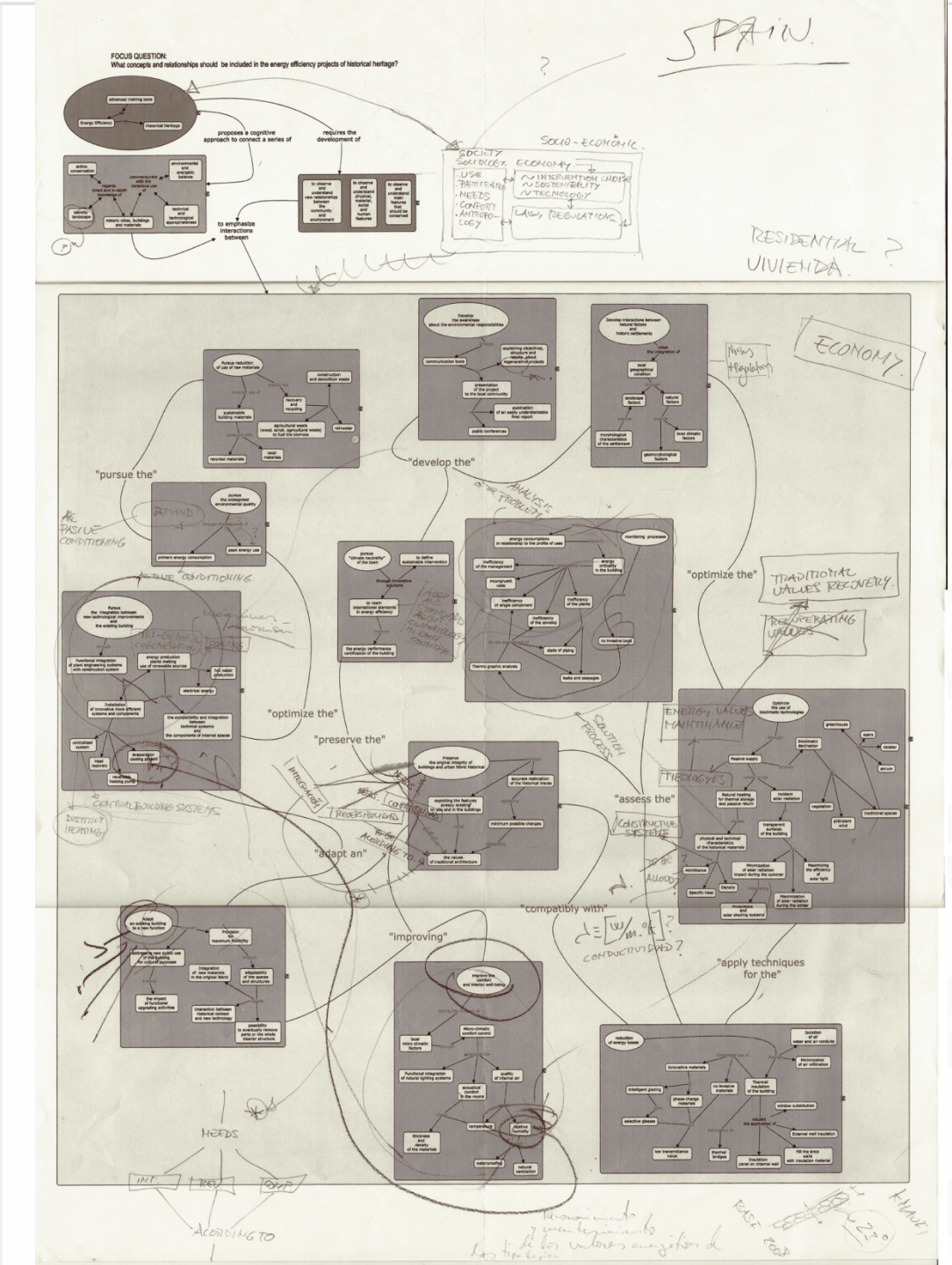
COURSE FOR TRAINERS


FOCUS QUESTION:
What concepts and relationships should be included in the energy efficiency projects of historical heritage?
SPAIN.
SOCIO-ECONOMIC
RESIDENTIAL ?
VIVIENDA.
ECONOMY.
"pursue the"
"develop the"
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TRADITIONAL VALUES RECOVERY.
ENERGY VALUE MAINTENANCE
TYPOLOGIES
CONSTRUCTIVE SYSTEMS
CENTRAL HEATING SYSTEMS
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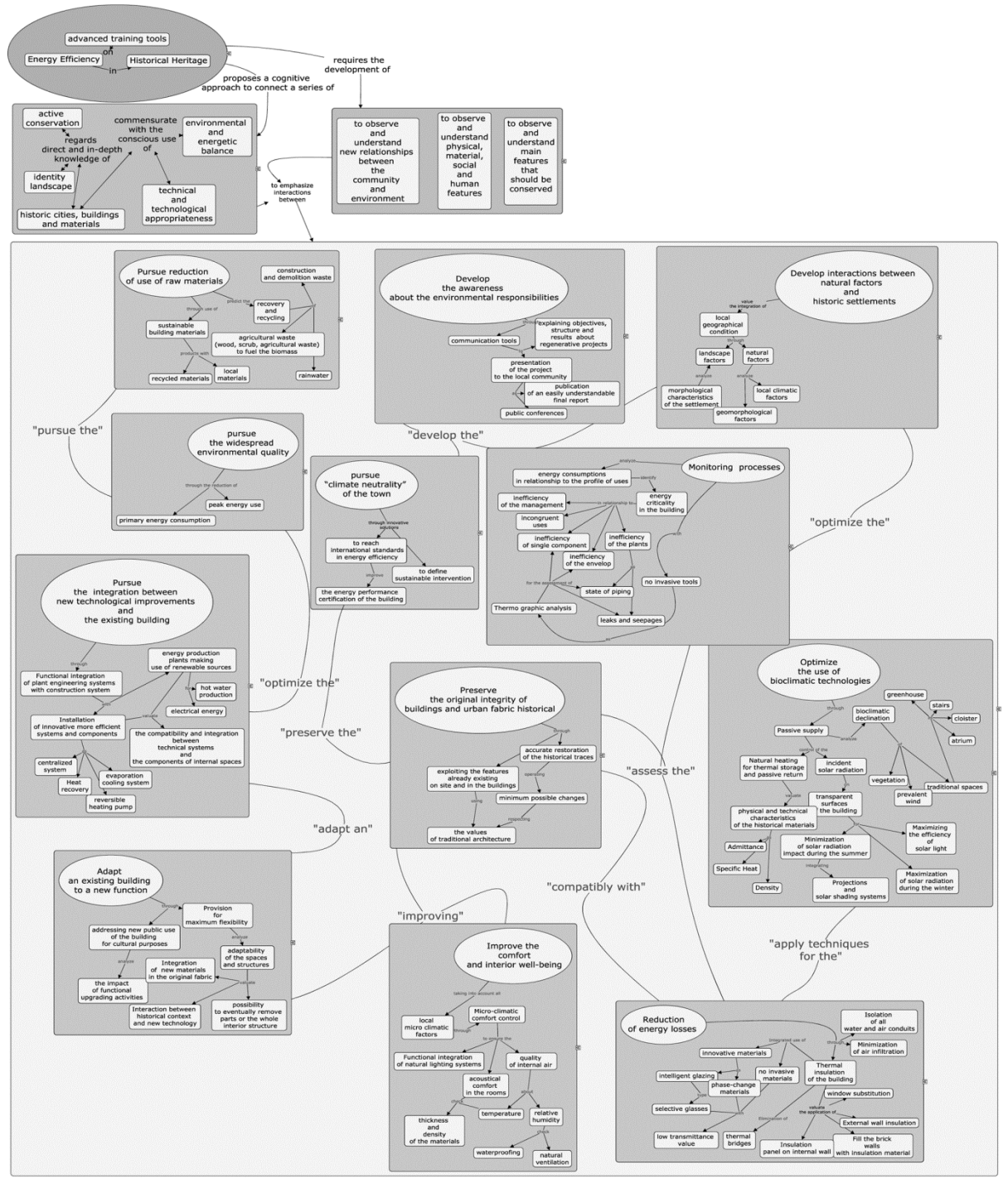
ACCORDING TO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Group composition	Clarification of concepts	Introduction of new concepts	Articulation of old concepts	New proposition with the same concepts	Introduction of new connections	Introduction of new domains of knowledge
Group a n.1 experts in energy systems n.3 experts in energy management	●	●		●		●
Group b n.4 experts in architectural technology and environmental design		●	●	●		●
Group c n.3 experts in energy systems n.1 experts in informatics systems	●		●			
Group d n.2 experts in architectural technology n.2 experts in heritage preservation					●	
Group e n.3 experts in architectural technology and preservation n.1experts in geography	●			●	●	

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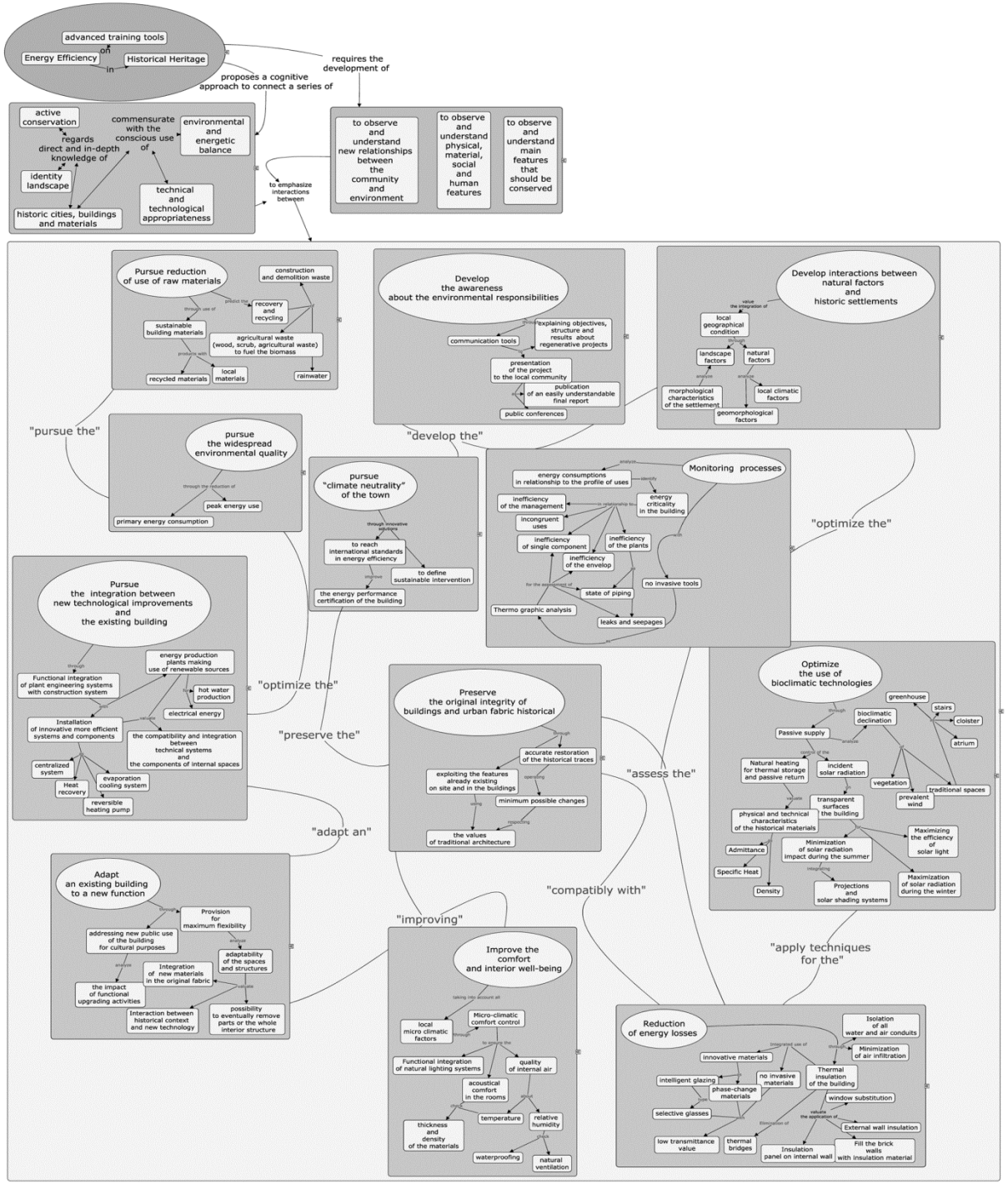
COURSE FOR STUDENTS

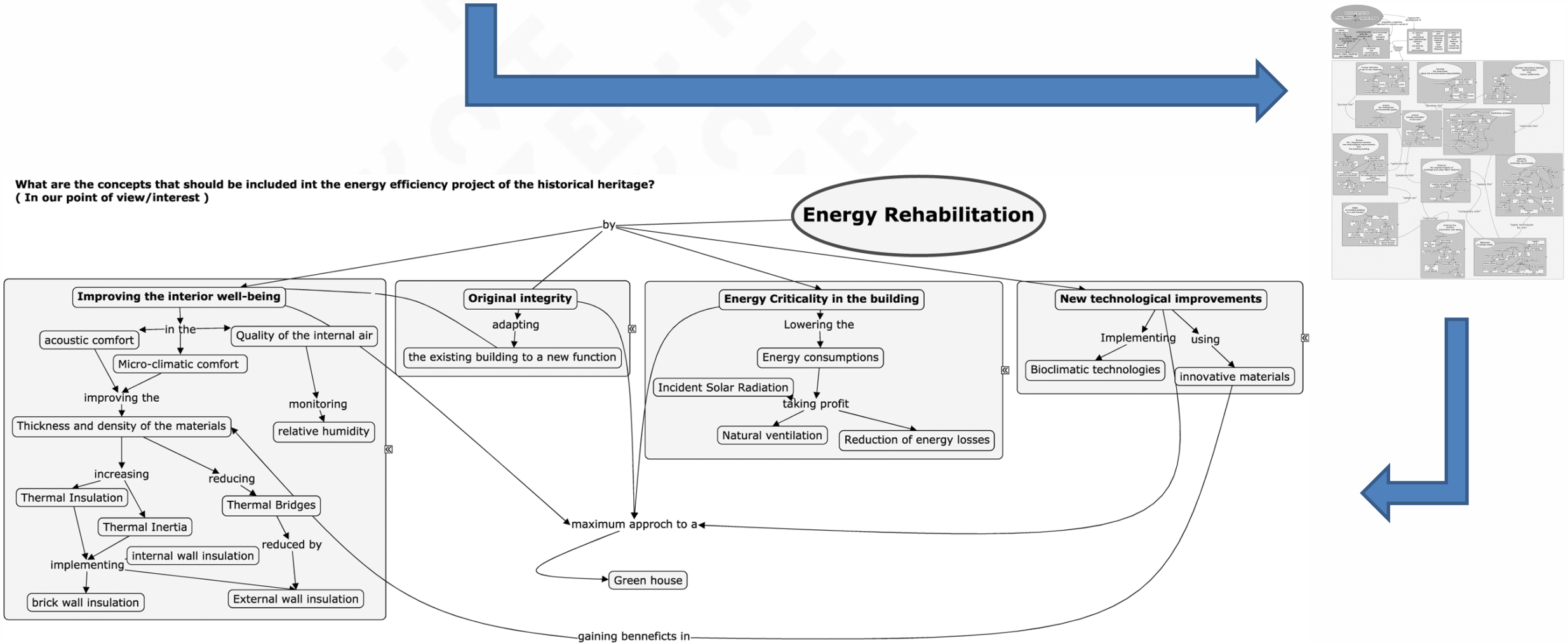
BASED ON:

- INTERDISCIPLINARY ACTIVITIES
- TASK OF GROUP

Exercise		Objective	Didactic tools	Focus question	Procedure	Result expected
1	**The preliminary construction of the previous knowledge**	To assess the level of prior knowledge	List of concepts	What concepts should be included in the design for the energy retrofit of historic buildings?	1_to list coherent concepts answering the focus question (in 60 minutes) 2_ brainstorming	Preliminary list of concepts as a starting point to develop knowledge
2	**The didactic use of Eh-cmap_00**	To build the previous knowledge on Energy efficiency in Historic Heritage	Eh-cmap_00; Cmap software		1_you have to read Eh-cmap_00 and select 15-25 concepts you know; 2_rank order (from the most general concept to most detailed concepts; 3_choose explicit Linking words to relate concepts ; 4_continue building concept hierarchy ; 5_search for possible cross-links 6_ brainstorming	Assessing the participants' prior knowledge.
3	**The didactic use of the Case Studies**	To articulate the knowledge on Energy efficiency in Historic Heritage	Study Cases textual form map form; Cmap software	Which concepts and relationships can you articulate in the study case selected?	1_compare textual form with map form of the study case; 2_point out the concepts and relationships that you consider more relevant on the existing map; 3_search for more information on the textual form ; 4_articulate the map with the new information ; 5_search for possible cross-links 6_ brainstorming	to articulate information and construct a critical point of view in order to analyse and solve the problems
4	**Mapping scientific papers**	To deepen the knowledge on energy efficiency in historic heritage	Scientific Paper; Eh-cmap_00; Cmap software; Internet	Proposed by participants	1_ point out relevant concepts from scientific paper; 2_build the focus question; 3_put in relation the new concepts with the concepts proposed by Eh-cmap_00; 4_talk about your choices with your colleague.	to acquire new technical and non-technical information and give them sense and value.



S15	building envelop; material features; use natural elements; passive systems; authenticity; preservation; comfort; landscape; building memory sustainable memory; **rehabilitation;** intervention; heat factor; energy saving; architecture



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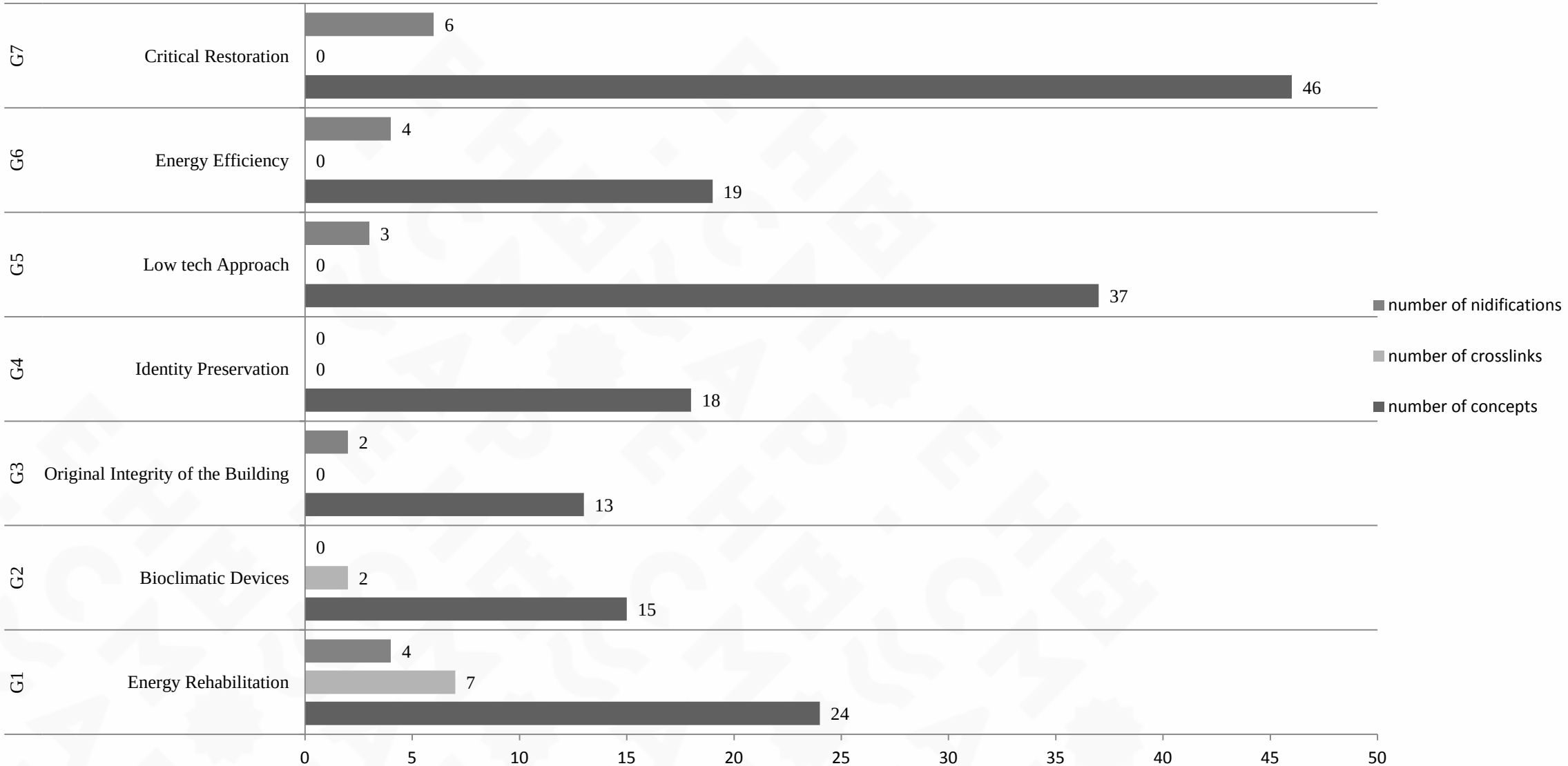
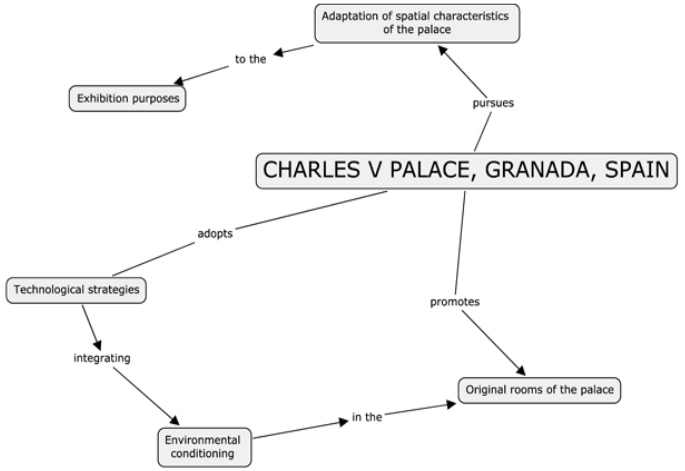
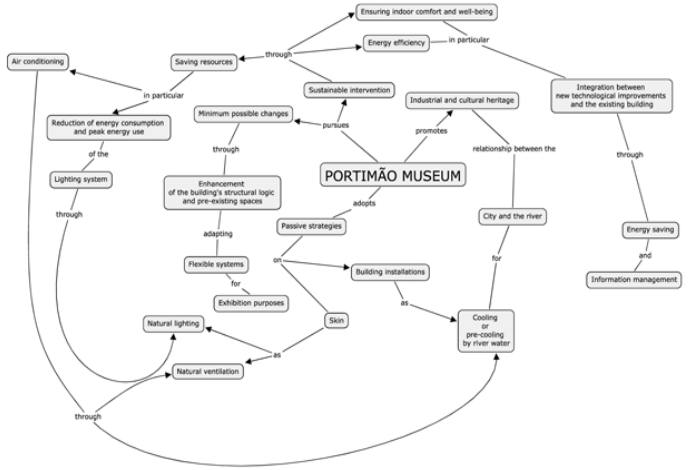
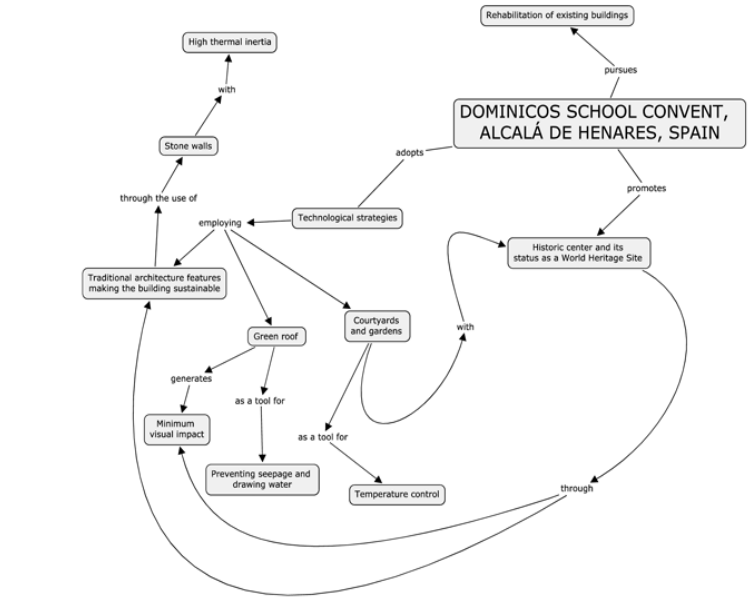




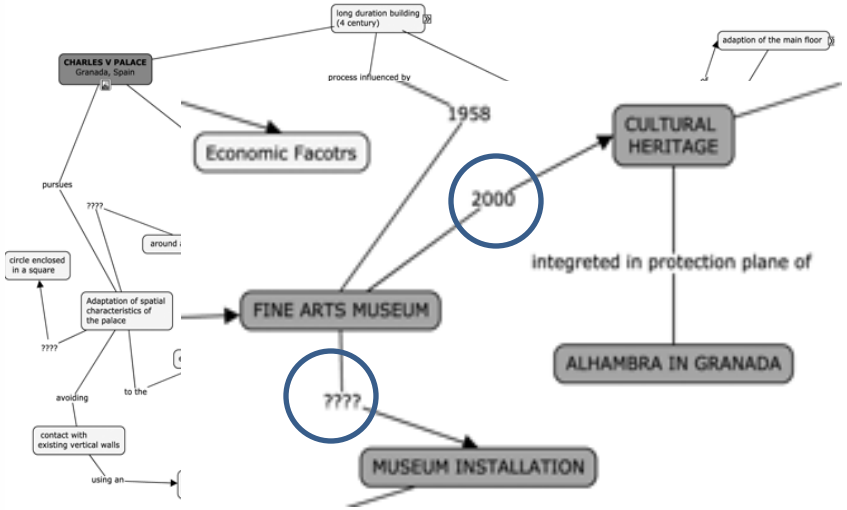
a: basic thematic map on
Charles V Palace, Granada, Spain



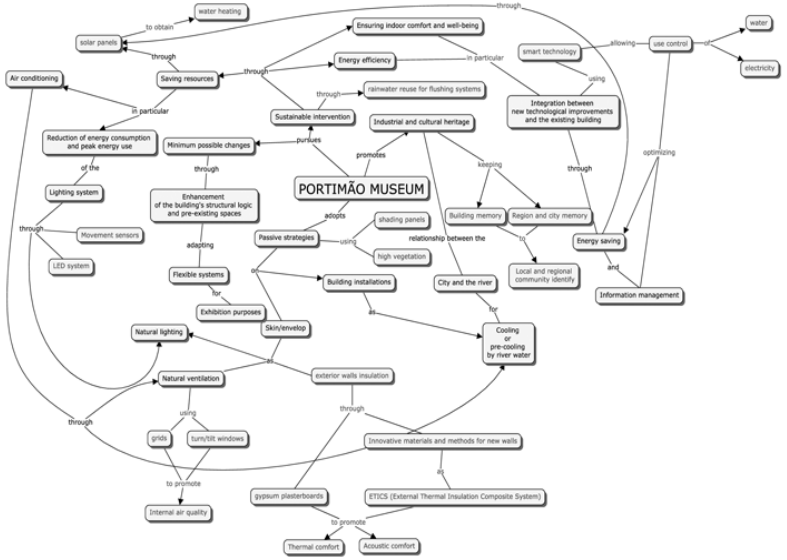
b: basic thematic map on
Portimão Museum, Lisbona, Portugal



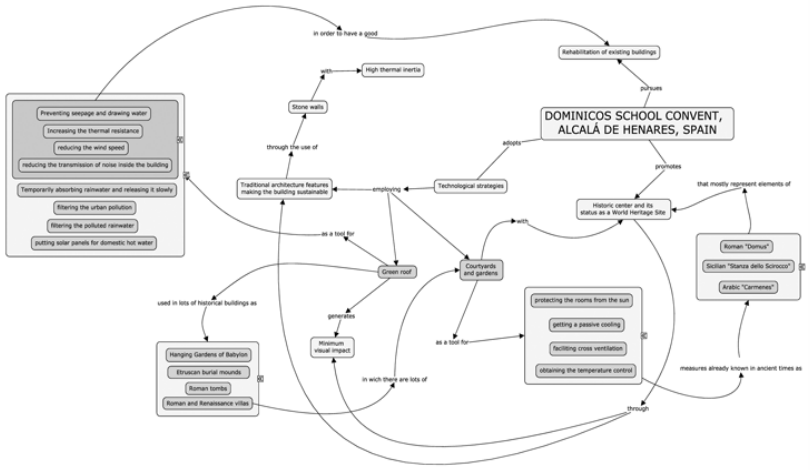
c: basic thematic map on
Dominicos School Convent, Alcala De Henarse, spain



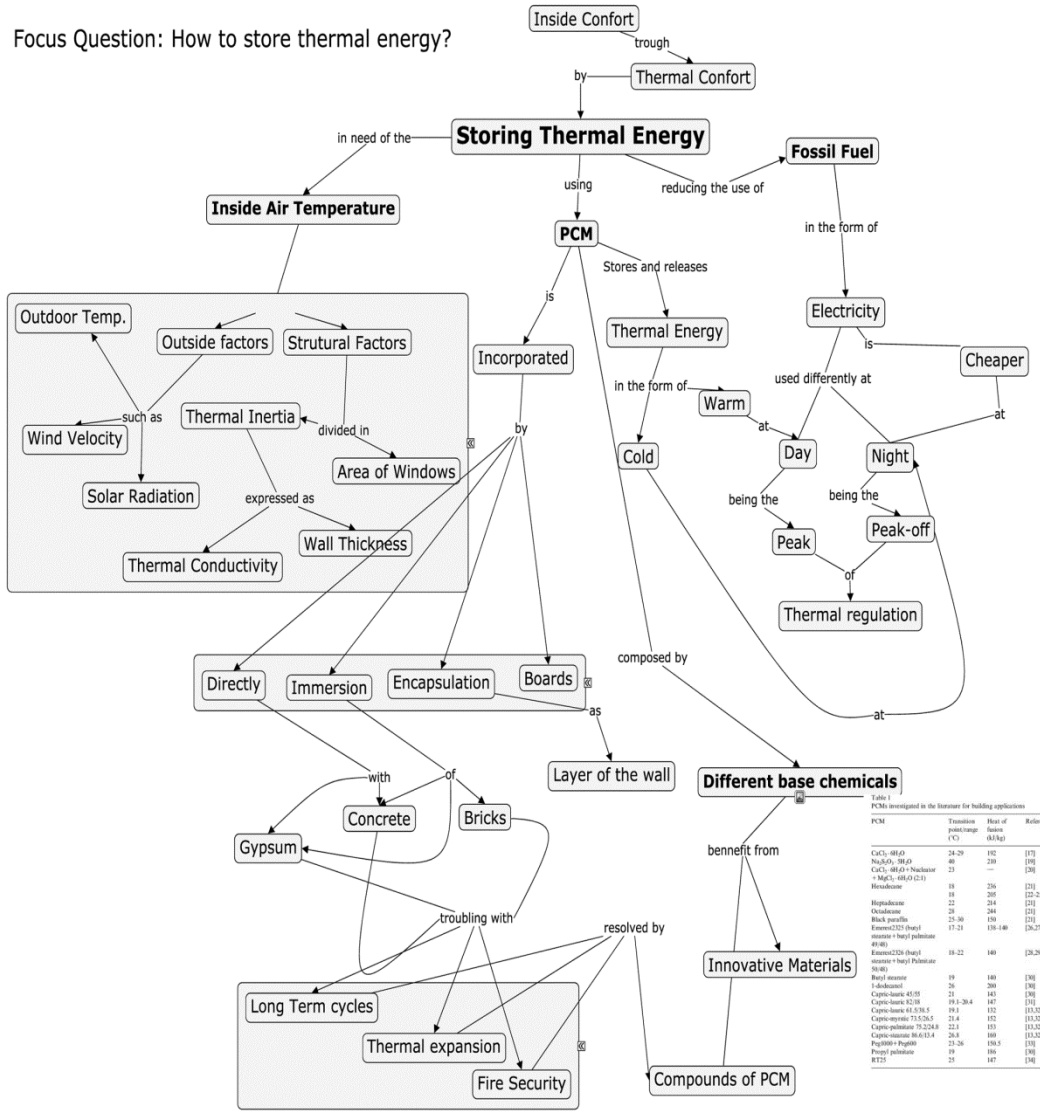
a: thematic map elaborated by G_04



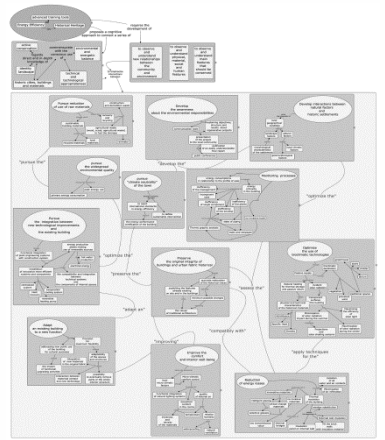
b: basic thematic elaborated by G_06



c: basic thematic map elaborated by G_07



Group	Scientific paper analyzed by participants	Focus Question proposed by participants	EH_Cmap_00 knowledge domain investigated
01	Application of latent heat thermal energy storage in buildings: State-of-the-art and outlook (Zhang et al, 2006)	How to store thermal energy?	Reduction of energy losses
02	Energy efficiency of windows in historic buildings (Exner et al 2014)	not declared	Use of bioclimatic technologies
03	Cultural heritage and sustainable development in SUIT (Hassler et al, 2002)	How to investigate on the sustainability of urban historical areas?	Cultural issues
04	Energy rehabilitation studies of a large group of historical buildings: a case study (Rego et al, 1998)	How to rehabilitate energy performance in historical buildings?	Original integrity of buildings and urban fabric historical
05	Energy efficiency and renewable solar energy integration in heritage historic buildings (López, 2013)	How to integrate solar energy into heritage historic building?	Integrations between new technological improvements and the existing building
06	Definition of a new design process function (Yaldiz et al, 2013)	What kind of planning process to reuse monumental buildings?	Existing building to a new
07	Beyond Restoration. Valorization of a Public Monumental Heritage Asset (Terpolilli,2012)	not declared	Cultural issues



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INDICATORS TO ASSESS THE KNOWLEDGE PATH QUALITY

1	**Quality of hierarchical structure**	2	**Quality of meaningful discourse**	3	**Quality of external links**
1.1	Number of concepts	2.1	Clarity of the focus question	3.1	Coherence with external links
1.2	Number of crosslink	2.2	Articulation of the propositions	3.2	Explanatory notes
1.3	Number of nidifications	2.3	Logic of the discourse	3.3	References to support the study

	Index	**Definitions**
1.1	Number of concepts	Ability to gather information
1.2	Number of crosslink	Ability to build dynamic connections among concepts
1.3	Number of nidifications	Ability to switch from simple forms of knowledge representation to complex one
2.1	Clarity of the focus question	Ability to define a problem clearly
2.2	Articulation of the propositions	Ability to articulate a concept through a logical sequence of more and more detailed information
2.3	Logic of the discourse	Ability to present an argument competently
3.1	Coherence with external links	Ability to enhance interactive learning
3.2	Explanatory notes	Ability to provide information to facilitate the understanding and sharing
3.3	References to support the Study	Ability to select relevant documents and connect them to the concepts

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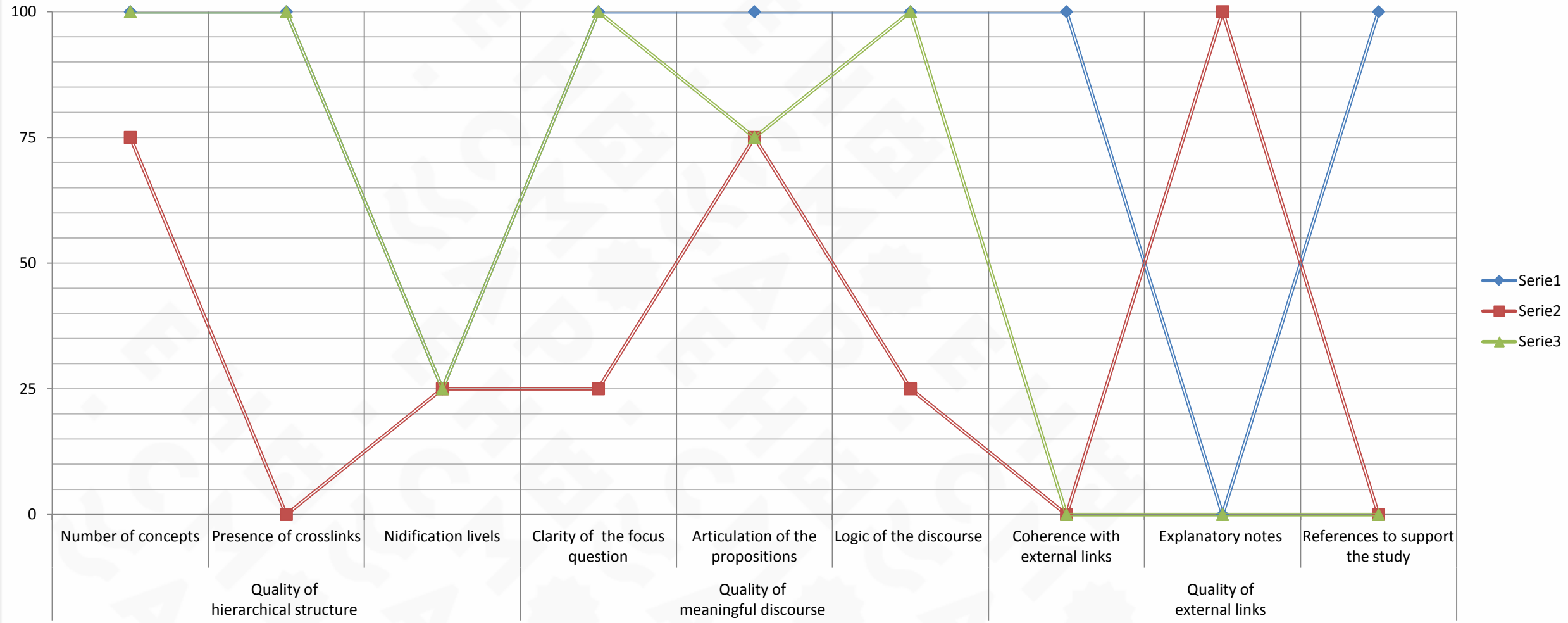
THE INDICATORS AS TOOLS TO REVEAL DEFICIENCY IN THE LEARNING PROCESS



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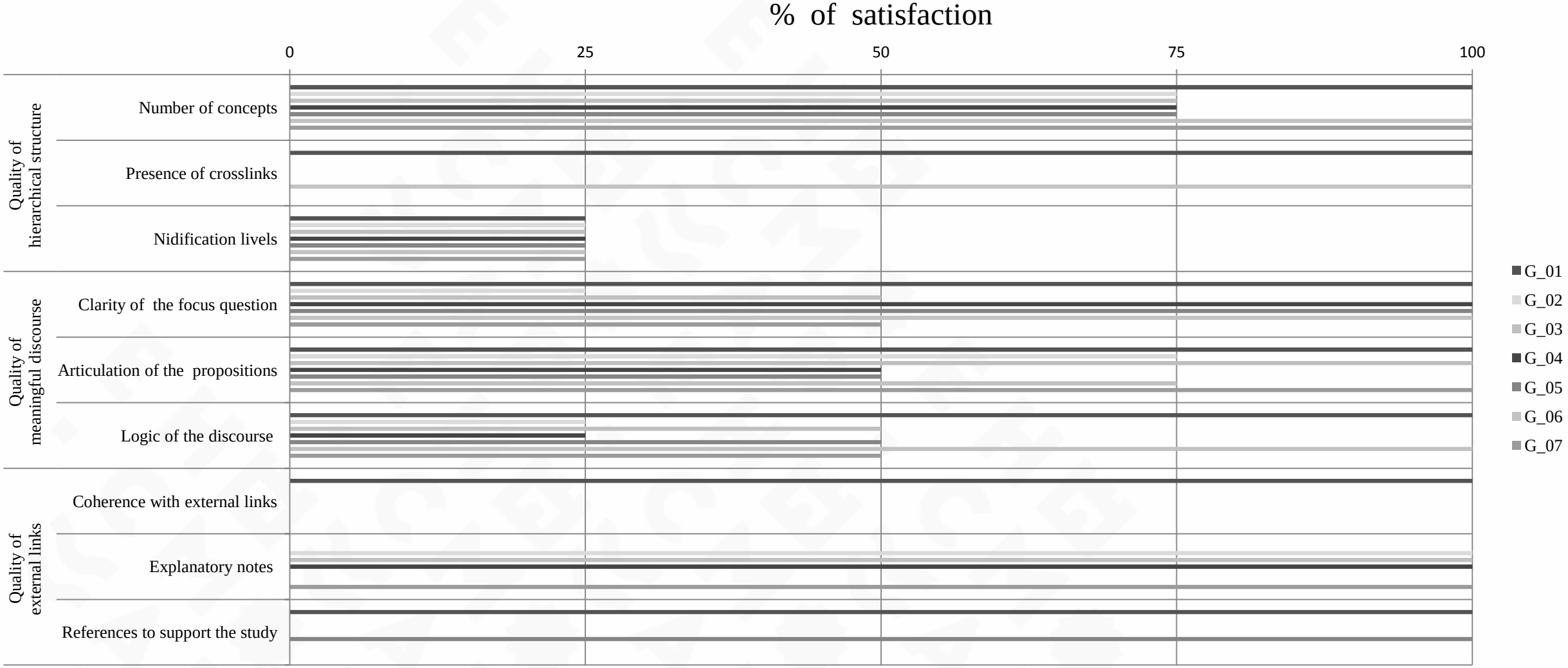
THE INDICATORS AS TOOLS TO ASSESS THE QUALITY OF THE LEARNING PROCESS



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FINAL ACTIVITY: THE EVOLUTION OF EH-CMAP_00

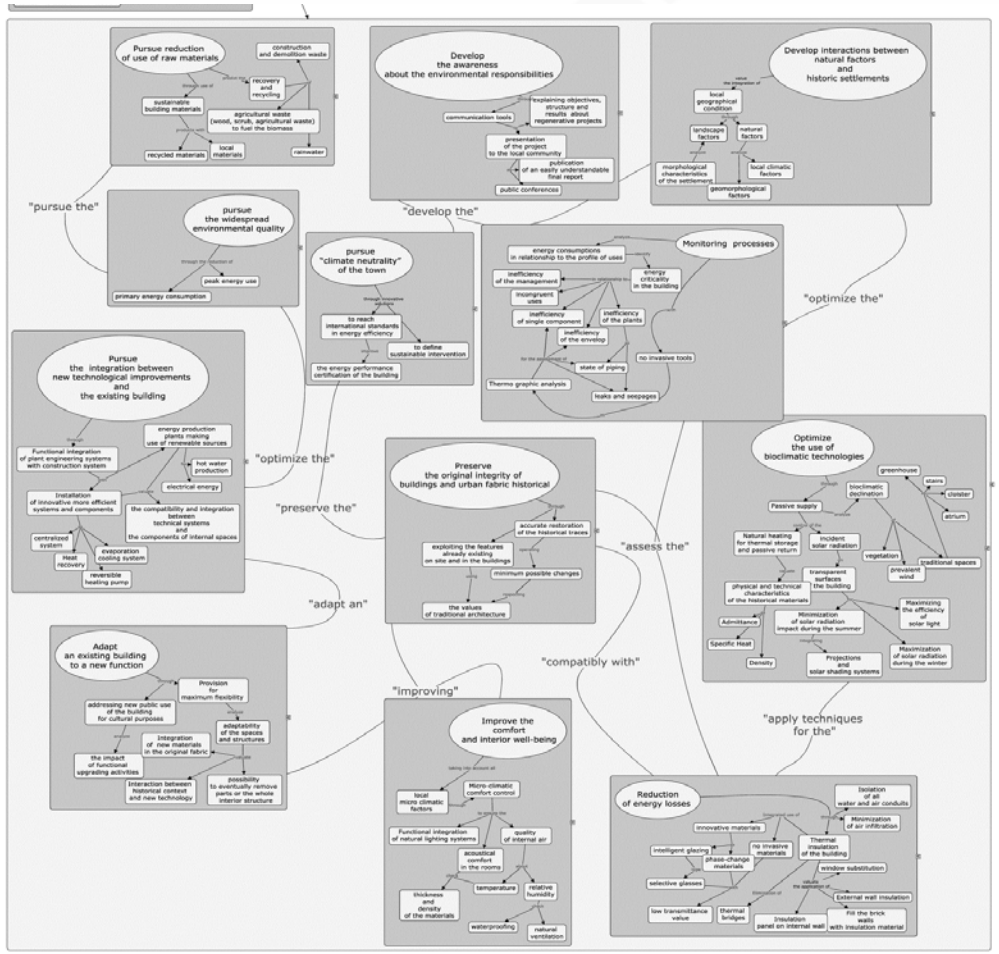
	EH-cmap_00	EH-cmap_01
Knowledge Domains	12	24
Concept Collected (Objectives and Strategies)	85	267
Suggested Crosslinks	0	12
Exercises (Instructional)	0	3
External Documents	0	124

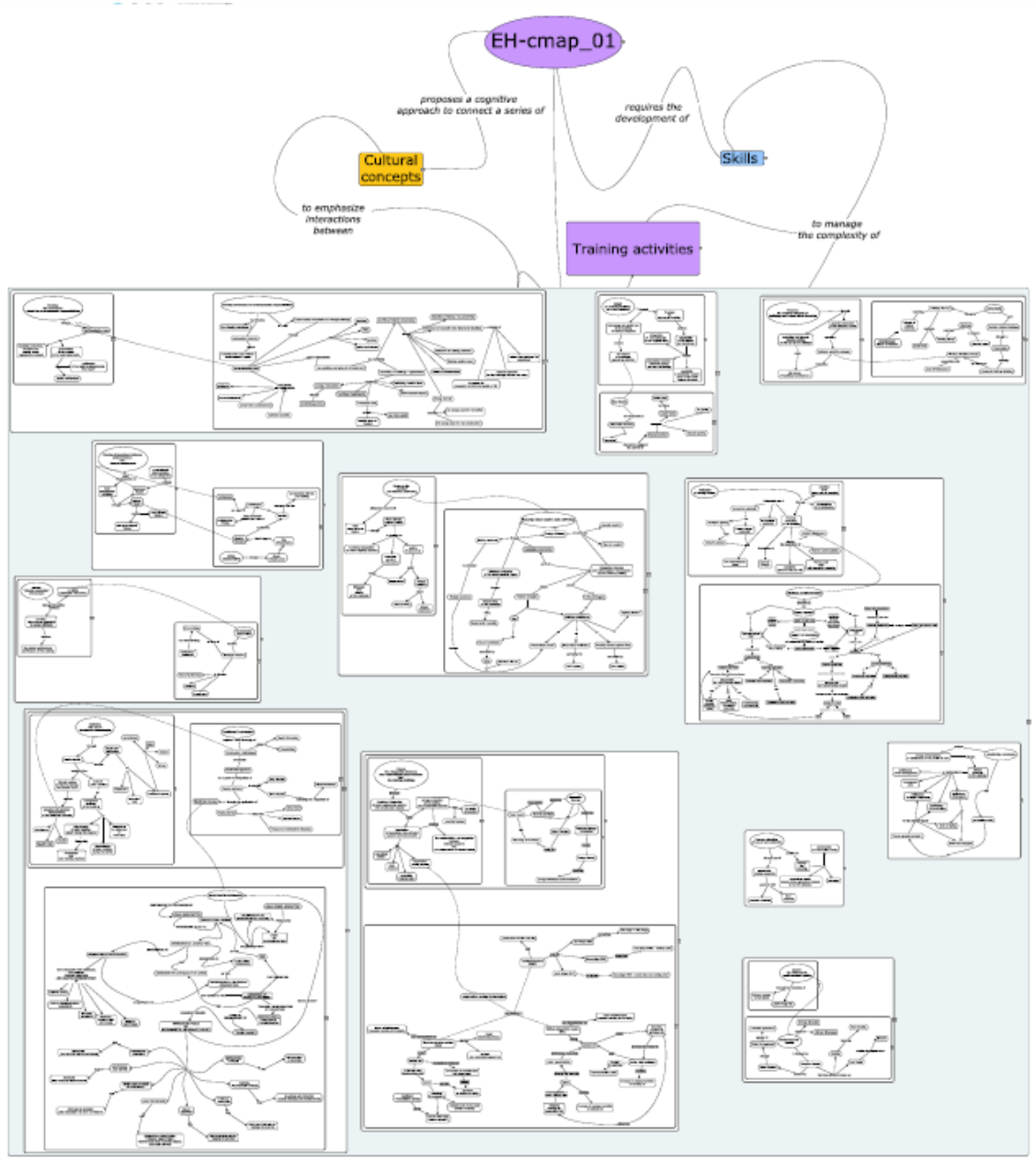
Table 01: indicators to describe the evolution of Eh-cmap from 00 version to 01 version

EH·CM·AP Advanced Training on Energy Efficiency in Historic Buildings

Dipartimento di Pianificazione Design Tecnologia dell'Architettura

Sapienza Università di Roma





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THE PURPOSES ACHIEVED BY THE PROJECT

• contributing to the circulation of educational outlines that operate, within a shareable theoretical framework, towards the transfer of dynamic, interactive knowledge of the themes of preservation and sustainability;

• innovating the learning process, based on interaction dynamics and creative capacities capable of shaping a critical, proactive reading of technologies and techniques towards the energy efficiency of historical buildings;

• innovating the instrumental frameworks that support training, integrating adaptable, modifiable cognitive systems able to facilitate the comprehension and development of information, both technical and non-technical, about energy efficiency in historical buildings.

THANK YOU!