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DAYLIGHTING RIVERS

TEACHING AND LEARNING METHODOLOGY

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Introduction

Among the most significant real-world issues, our territories often face environmental problems connected to climate change. Citizens are more and more familiar with extreme meteorological events and more often with dramatic issues. The most vulnerable land marks are rivers and streams that can represent a potential hydrological risk, affecting both environmental and anthropic systems.

Over recent years, due to urban sprawl, many rivers have been diverted or culverted, in favour of urban infrastructures and new neighbourhoods. This has increased the risks of flood, the loss of biodiversity along the stream, increased the water pollution and reduced also other services for the community, connected to the flowing water.

Daylighting Rivers aims to engage students and teachers of secondary schools in scientific and interdisciplinary investigations –STEM* including agriculture, economy but also history - about land cover and river studies, with emphasis on the effect of urban sprawl on soil loss and on river management.

*Science, Technology, Engineer, Mathematics

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Inquiry based learning (IBL)

- Inquiry-based learning is an approach to teaching and learning that places students' questions, ideas and observations at the centre of the learning experience.
- Educators play an active role by establishing a culture where ideas are respectfully challenged, tested, redefined and viewed as improvable, moving children from a position of wondering to a position of understanding and further questioning (Scardamalia, 2002).
- Underlying this approach is the idea that both educators and students share responsibility for learning.
    - Active participation
    - Self- directed
    - Generated new knowledge to the learner

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Structured Inquiry Based Learning

- Ideas are best introduced when students see a need or a reason for their use.
- Laboratory experiences can integrate other types of science learning activities, including lectures, reading, and discussion.
- Students are engaged in forming research questions, designing and executing experiments, gathering and analysing data, and constructing arguments and conclusions as they carry out investigations.
- Diagnostic, formative assessments can be used to gauge the students' understanding and to promote their self-reflection on their thinking.

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Models of Inquiry Based Learning

Dewey (1933) outlined several important aspects of inquiry-based learning, such as defining a problem, formulating a hypothesis, and conducting tests.
Later on, interaction between phases, sequencing of phases, modifications in terminology, more definitions were introduced. However, contemporary inquiry cycles implicitly reflect aspects of earlier frameworks.

White and Frederiksen (1998) proposed an inquiry cycle of five inquiry phases: Question, Predict, Experiment, Model, and Apply

The 5E learning cycle model (Bybee 2006) is made of five inquiry phases: Engagement, Exploration, Explanation, Elaboration, and Evaluation.

Pedaste et al. (2015) found that different descriptions of inquiry cycles in the research literature use various terminologies to label phases that are essentially the same.
They resume the Inquiry Based Learning phases from different frameworks into 5 phases

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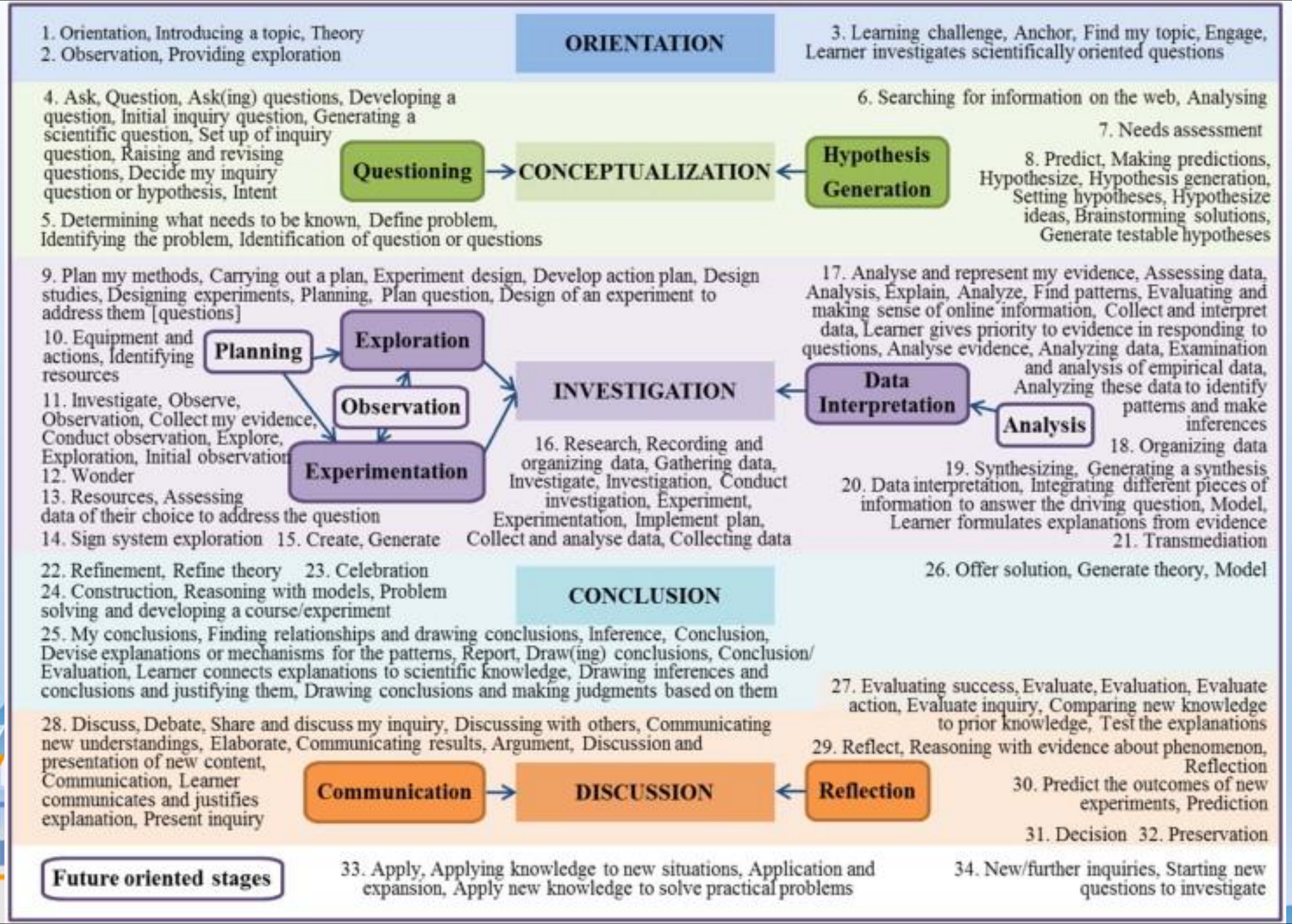
Pedaste's model



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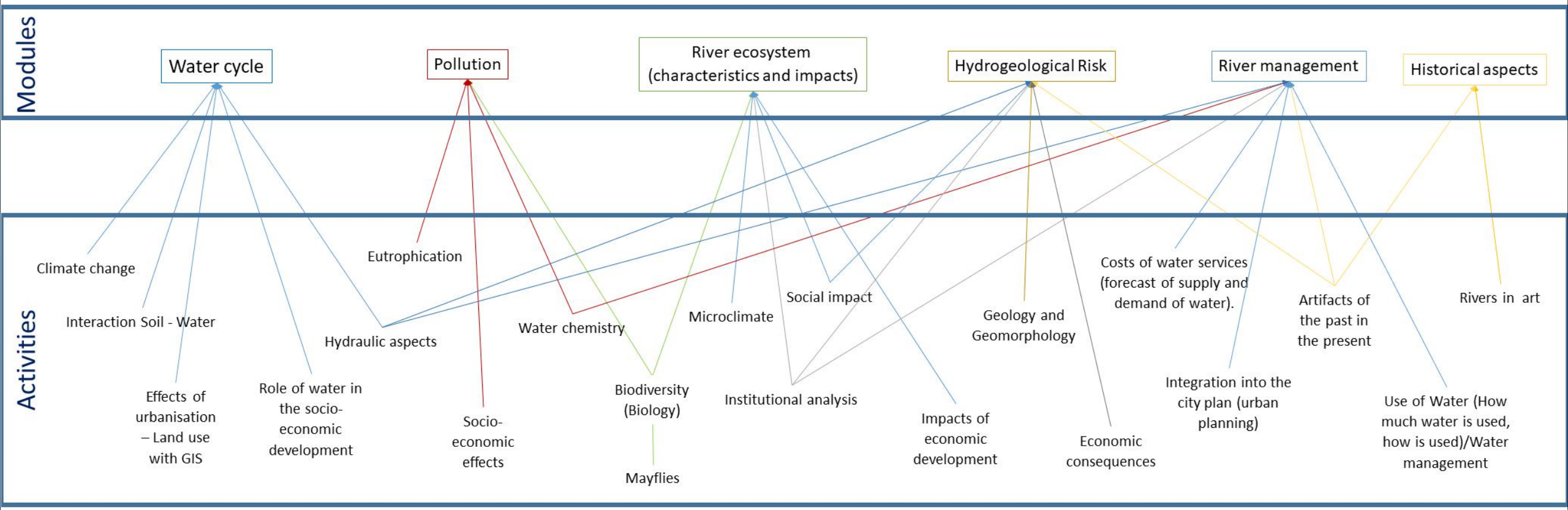
Thematic modules > Learning activities



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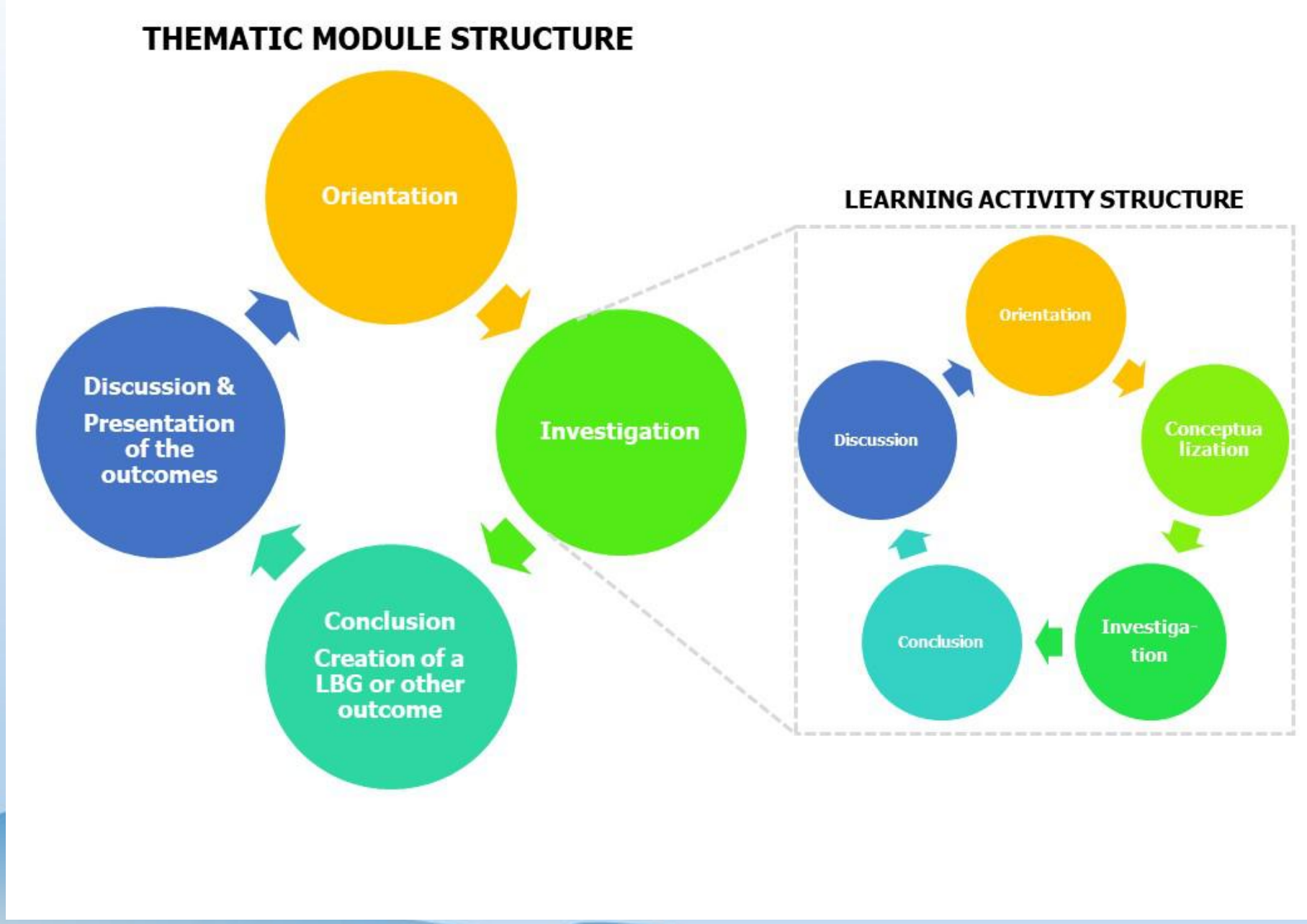
Pedaste's model in Daylighting Rivers



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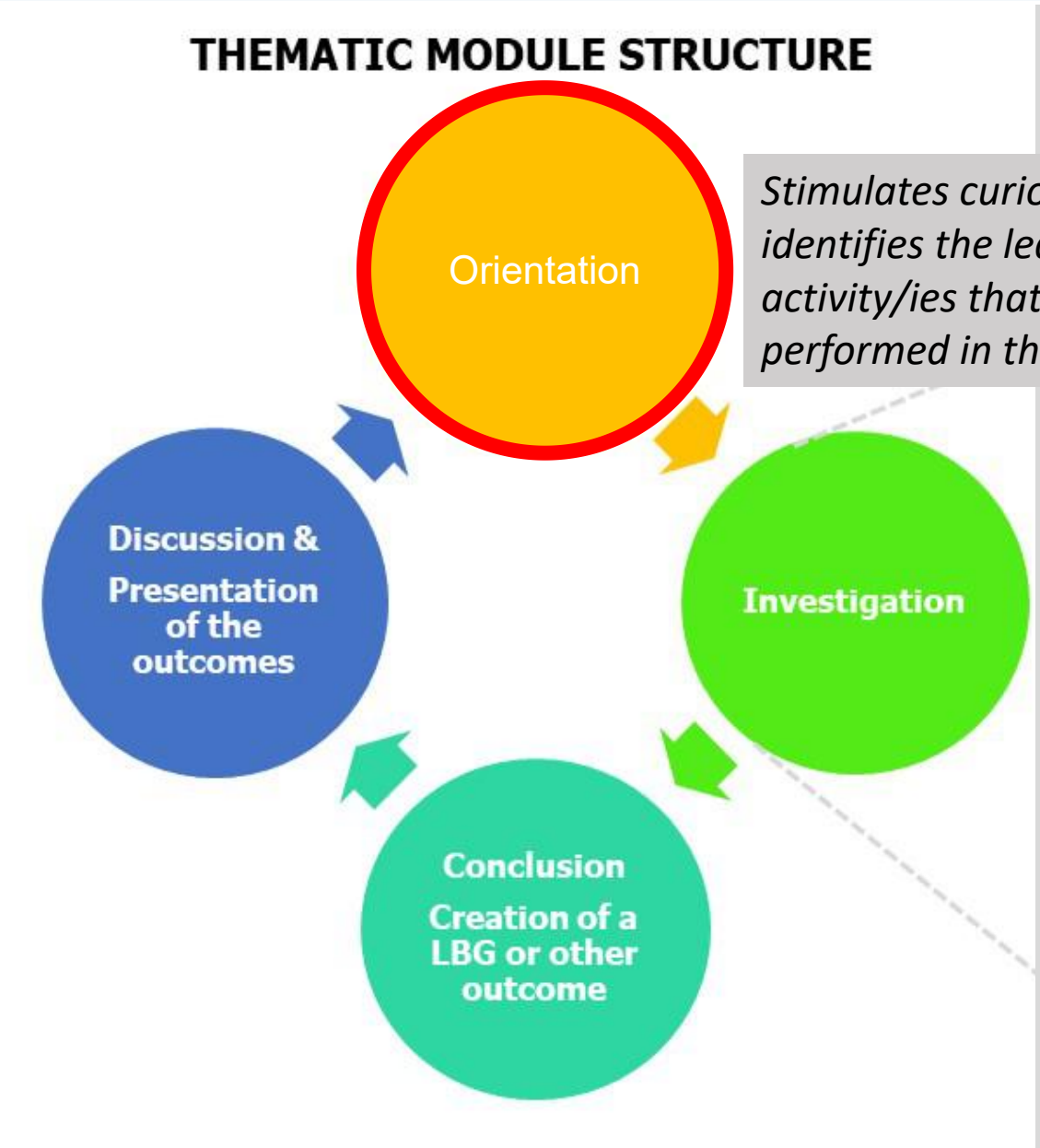
Pedaste's model in Daylighting Rivers



Stimulates curiosity and identifies the learning activity/ies that will be performed in the next phase

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An example

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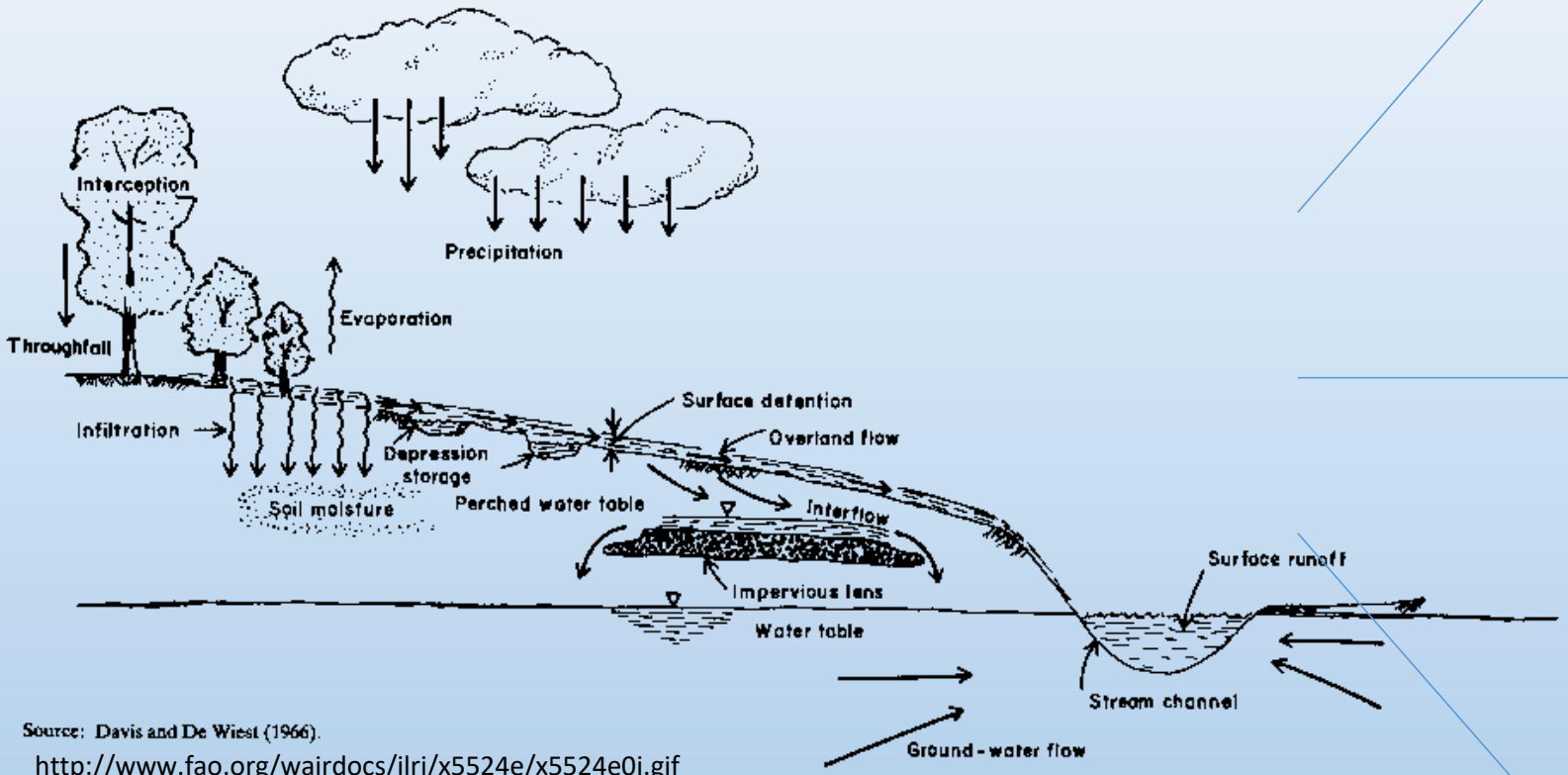
Orientation

Learning Activity

"think about a drop of rain, draft where it goes"



Source: Davis and De Wiest (1966).

http://www.fao.org/wairdocs/ilri/x5524e/x5524e0j.gif

Interaction soil-water

Urbanization/ land use

Climate change

Etc.

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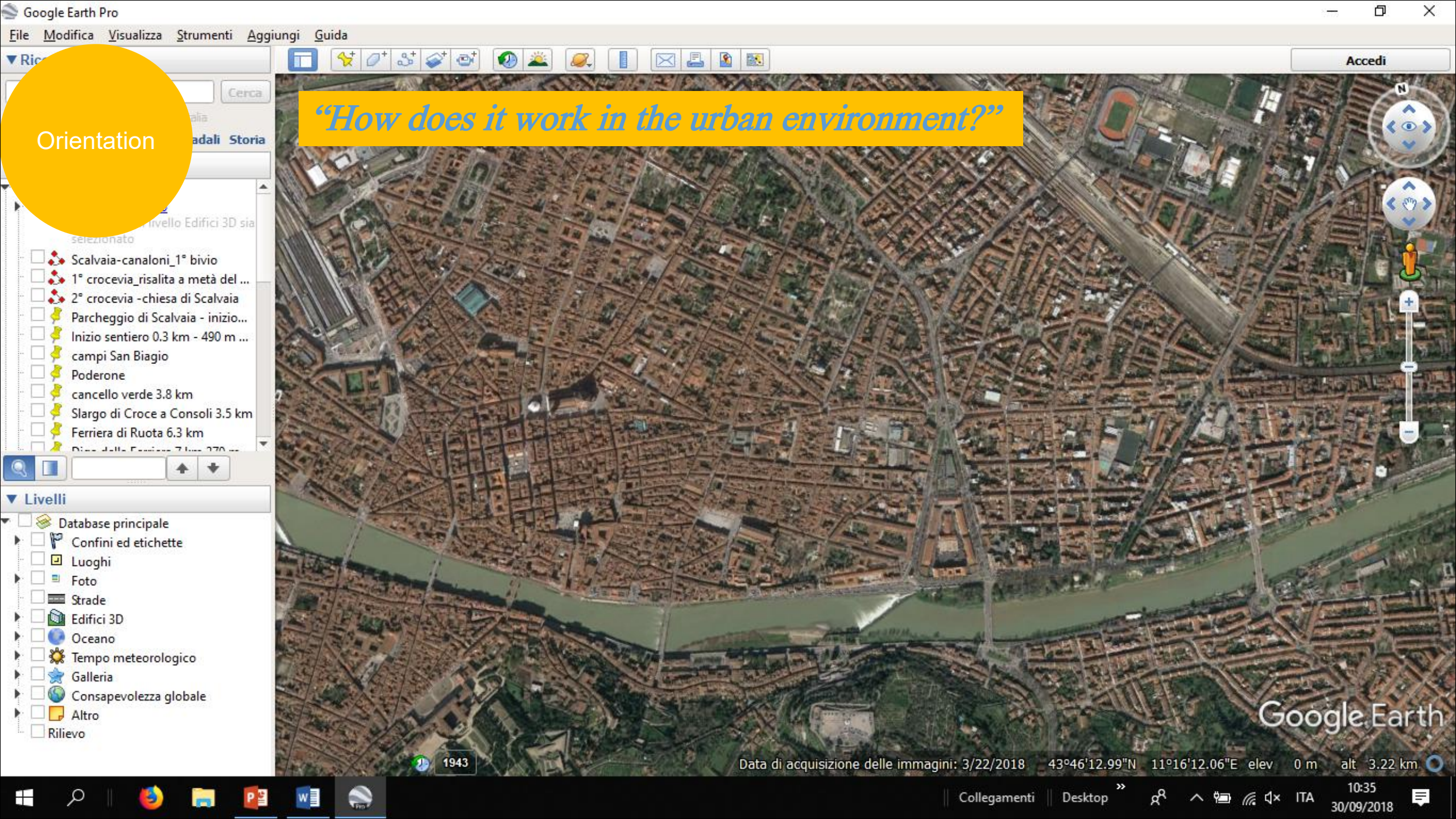
Google Earth Pro
File Modifica Visualizza Strumenti Aggiungi Guida
Accedi
Orientation
"How does it work in the urban environment?"
Cerca
Storia
Scalvaia-canaloni_1° bivio
1° crocevia_risalita a metà del ...
2° crocevia -chiesa di Scalvaia
Parcheggio di Scalvaia - inizio...
Inizio sentiero 0.3 km - 490 m ...
campi San Biagio
Poderone
cancello verde 3.8 km
Slargo di Croce a Consoli 3.5 km
Ferriera di Ruota 6.3 km
Livelli
Database principale
Confini ed etichette
Luoghi
Foto
Strade
Edifici 3D
Oceano
Tempo meteorologico
Galleria
Consapevolezza globale
Altro
Rilievo
1943
Data di acquisizione delle immagini: 3/22/2018 43°46'12.99"N 11°16'12.06"E elev 0 m alt 3.22 km
Google Earth
Collegamenti
Desktop
ITA
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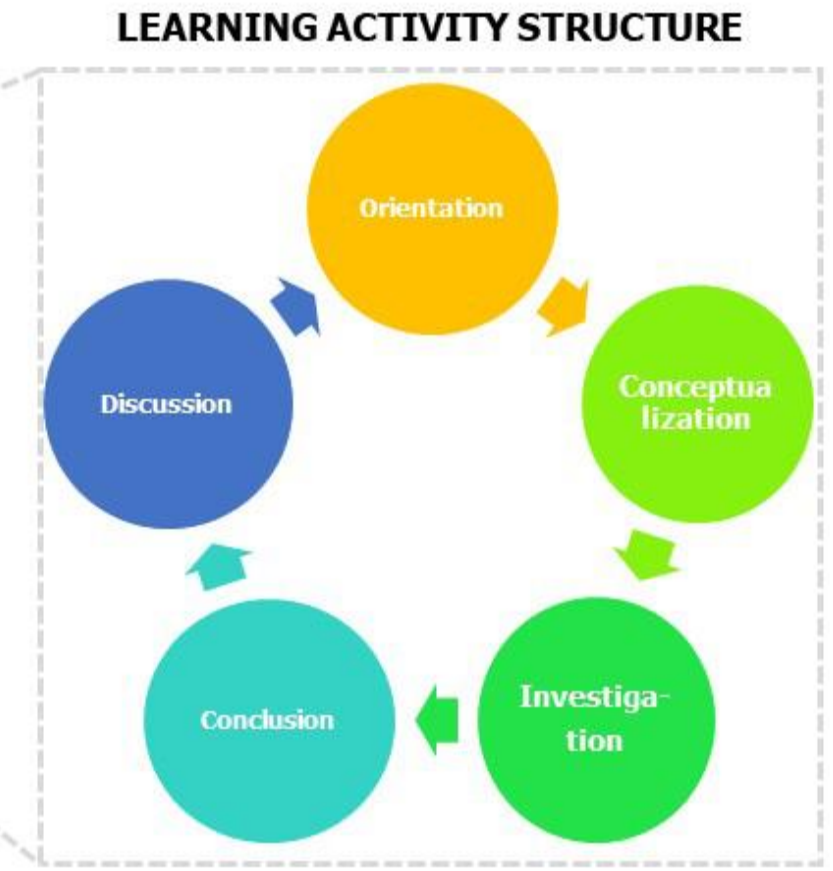
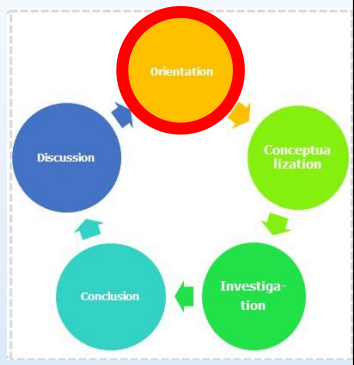
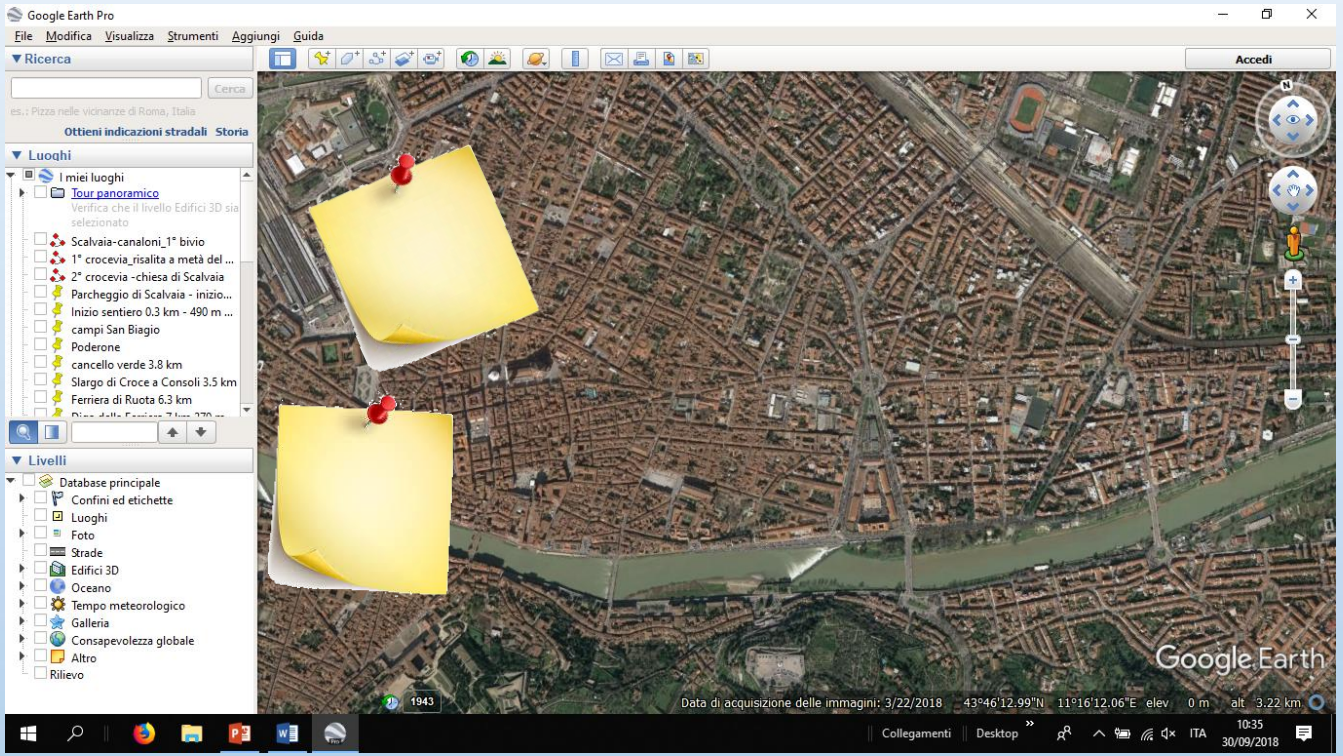
Pedaste's model in Daylighting Rivers



Orientation

e.g. "What kind of surfaces do you find in your neighborhood?





The teacher

- "creates interest",
- "generates curiosity",
- "raises questions",
- "elicits responses that uncover what the students know or think about the concept or topic".

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Conceptua-lization

"How much rain flows through and above the surfaces? Questioning and hypothesis

- *What are the playing variables?*
- *How to answer the question?*
- *How to estimate the rain flow in an urban area?*

The students

- Think freely, within the limits of the activity
- Formulate predictions and hypotheses
- Ask related questions

The teacher

- Encourages the students to work together
- Observes and listens to the students as they interact

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Investigation

Planning and carrying out an investigation on water cycle

- *Planning the experiment*
- *gathering materials for calculating the permeability of different surfaces,*
- *Using digital maps of the urban area for soil cover analysis*
- *Performing the experiment and analysis*

The students

- Think freely, within the limits of the activity
- Test predictions and hypotheses
- Record observations and ideas
- Formulate explanations
- Ask related questions
- Suspend judgment
- Listen critically to others' explanations
- Question others' explanations

The teacher

- Redirects the students' investigations when necessary
- Acts as a consultant for students
- Encourages the students to explain concepts and definitions in their own words

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Conclusion

Conclusions and comparisons with hypothesis and questions.

The conclusions should lead to define the environmental impact of soil sealing on the water cycle

The students

- Use recorded observations and explanations to draw reasonable conclusions
- Listen to and tries to comprehend explanations that the teacher offers
- Refer to previous activities
- Assess own understanding

The teacher

- Formally clarifies definitions, explanations, and new labels when needed
- Uses students' previous experiences as the basis for explaining concepts
- Assesses students' growing understanding

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Discussion

In the discussion learning is verified.

Findings are presented by communicating with others (peers, teachers) and collecting feedback.
Reflection on the process and findings.

The students

- Present the results
- Demonstrate understanding or knowledge on concept or skill
- Evaluate own progress and knowledge
- Ask related questions that would encourage future investigations

The teacher

- Looks for evidence that the students have changed their thinking or behaviour
- Allows students to assess their own learning and group-process skills
- Assesses students' knowledge and skills

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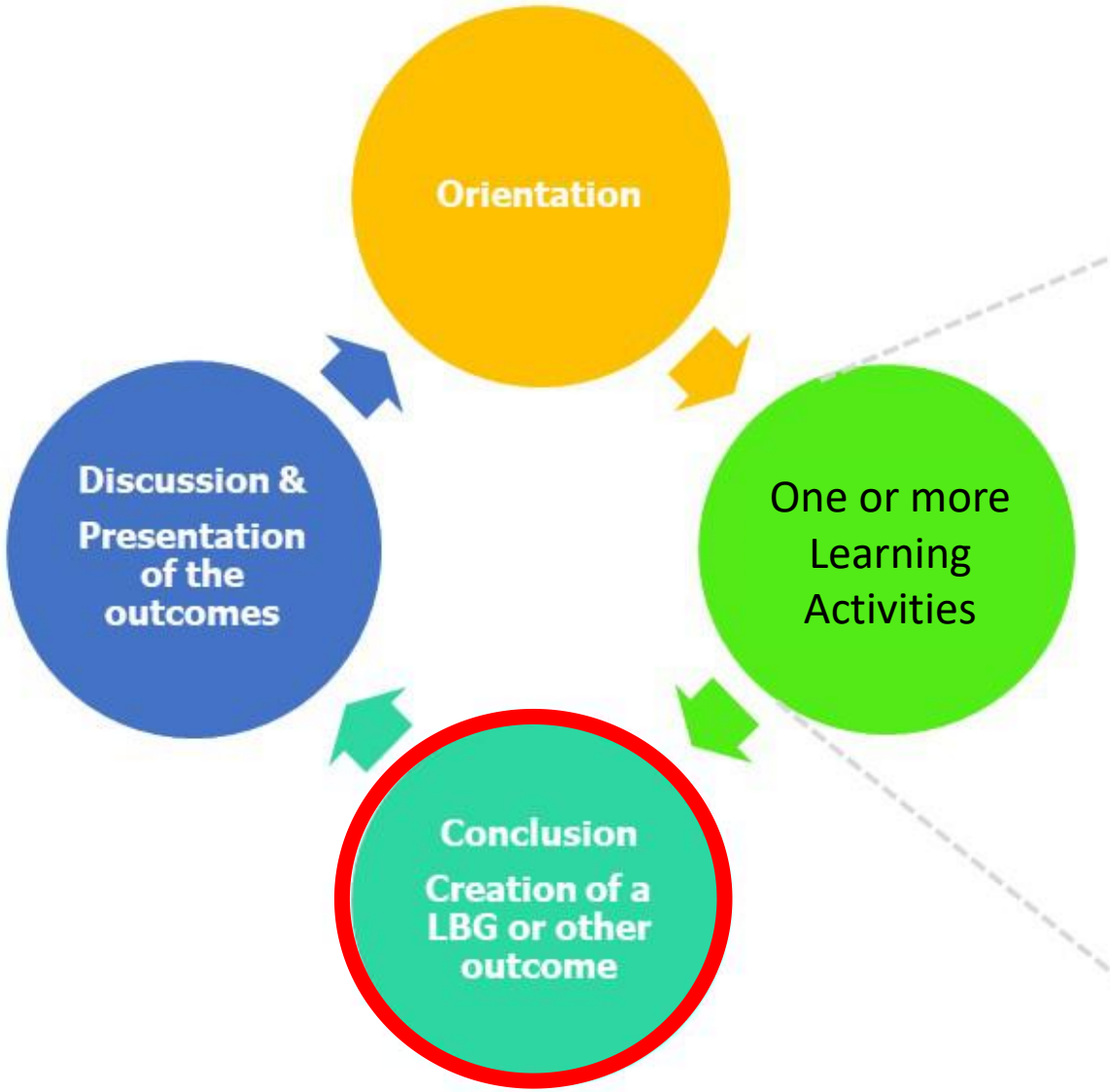
THEMATIC MODULE STRUCTURE



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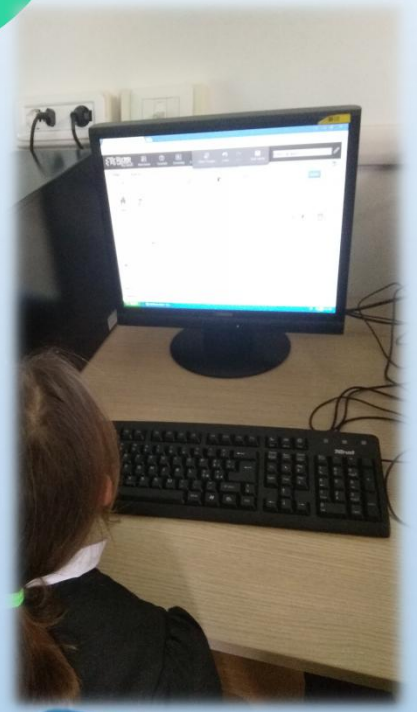
Conclusion

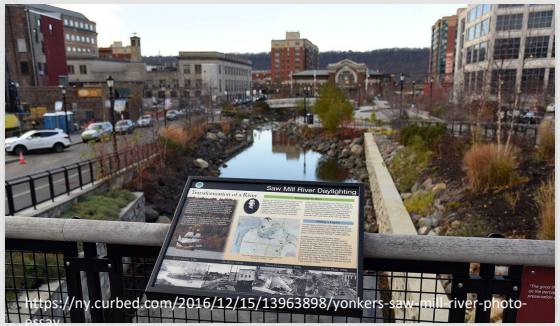
The knowledge acquired from different activities and conclusions are gathered together

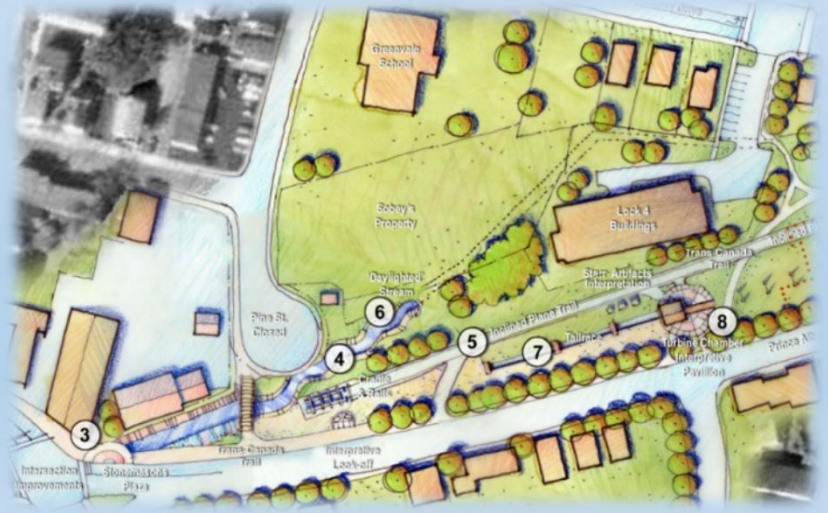


Story-telling: students create a story along a real route, shaping a Location Based Game

or

Urban design project to regenerate a covered river





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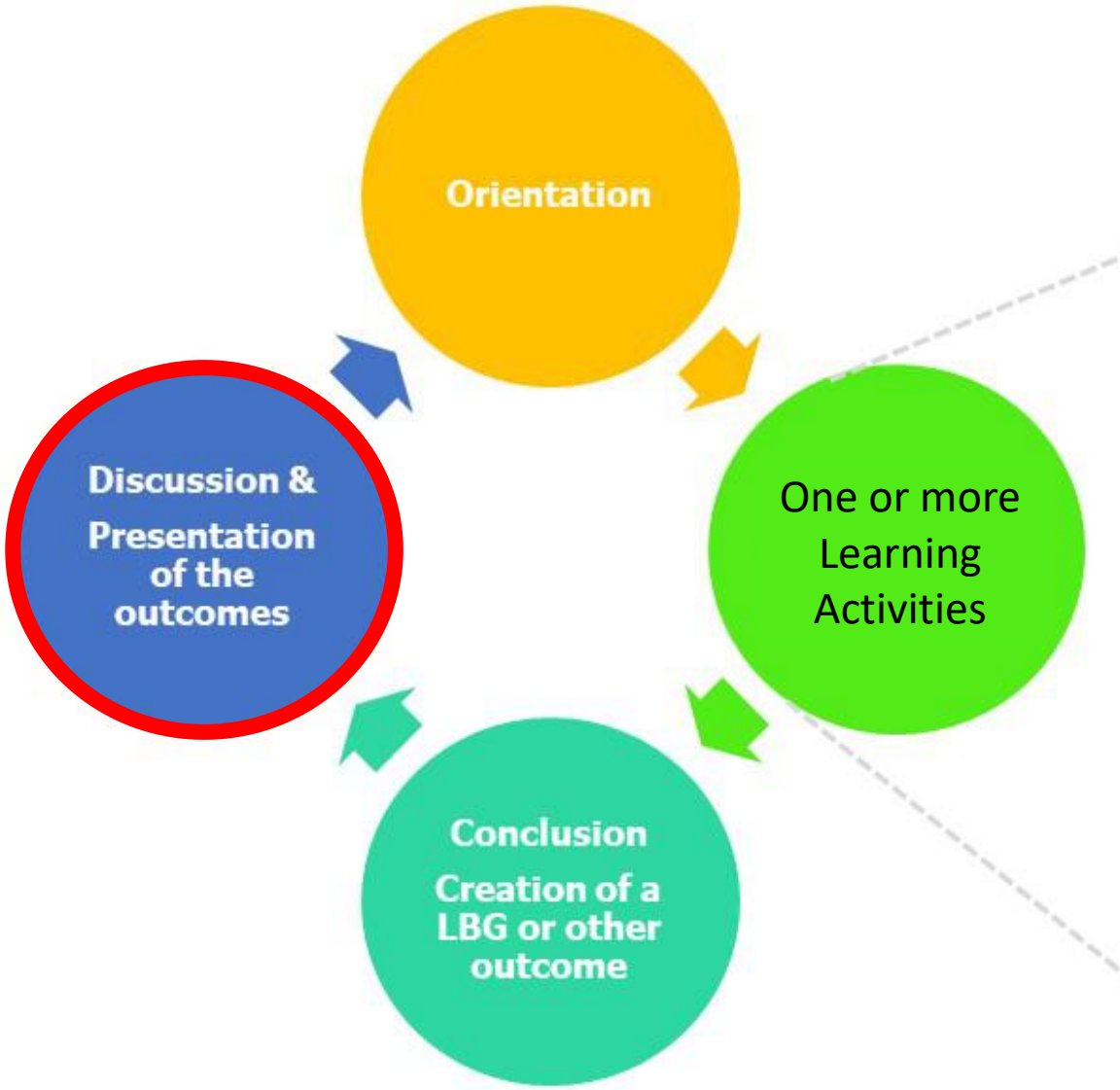
THEMATIC MODULE STRUCTURE



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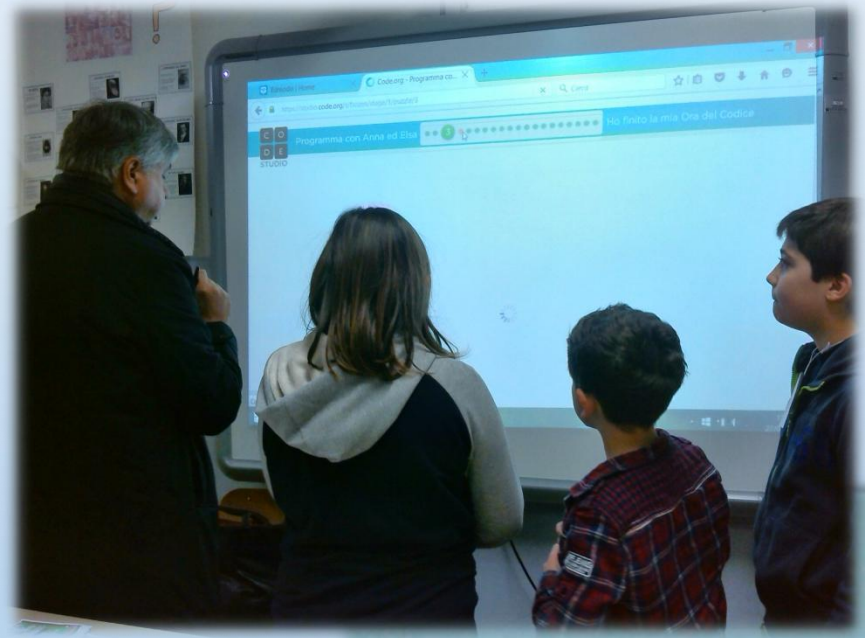
Discussion

Students present their outcomes to peers and teachers, local institutions, citizens in organized public events



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Evaluation

O1 – Youth and facilitators' skills and competences needs

The survey, submitted before developing the module implementation, aims to identify:

- The topic of interest
- the gap between actual and required levels of knowledge,
- skills and attitudes

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Evaluation

O5 - The evaluation of the modules and assessment of the intervention's efficacy

The survey will be submitted to teachers and students before and after module's implementation. In order to assess the

a) increased acquisition of competences and skills;
b) increased attitude of students toward STEM
c) decreased career decision-making difficulties;
d) increased career decision-making self-efficacy;
e) increased teaching self-efficacy and effectiveness

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That’s all, thanks

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