A transdisciplinary project-based learning approach setting the ground for launching the Innovation and Technology Transfer Center

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Ovidius University of Constanța

Location

- Constanța, on the Black Sea cost of Romania
- Central campus and Northern campus

History

- 1961 - established as a public higher education institution
- 1990 - transformed into a comprehensive university
- 1991 - name changed after Ovid, Publius Ovidius Naso (43 BCE-17 CE)

Stats

- ~15000 students (75% BS, 16% MS, 3% PhD, 6% residents)
- ~1200 international students
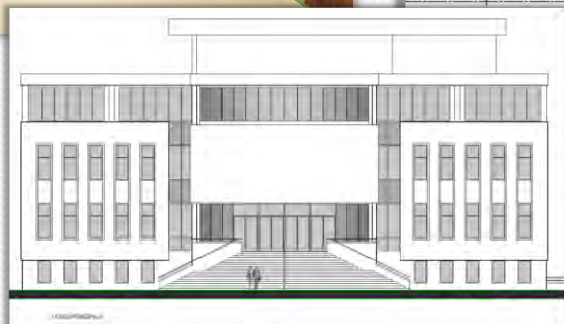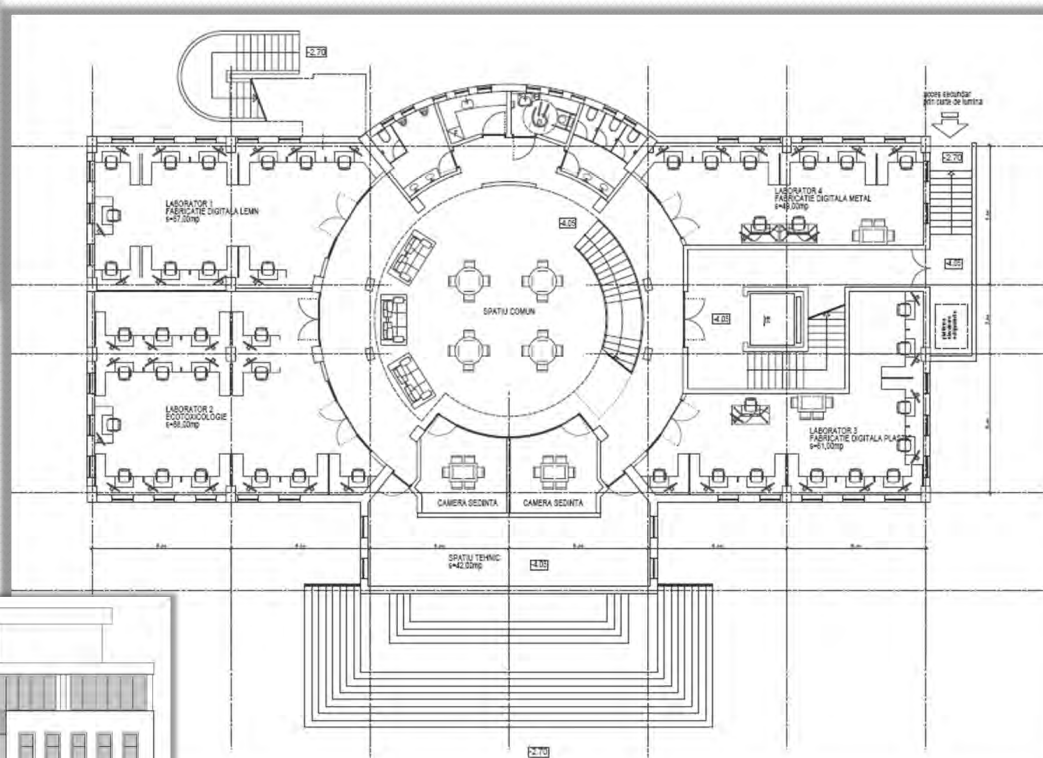- ~1100 academic & administrative staff
- ~30 million €/year
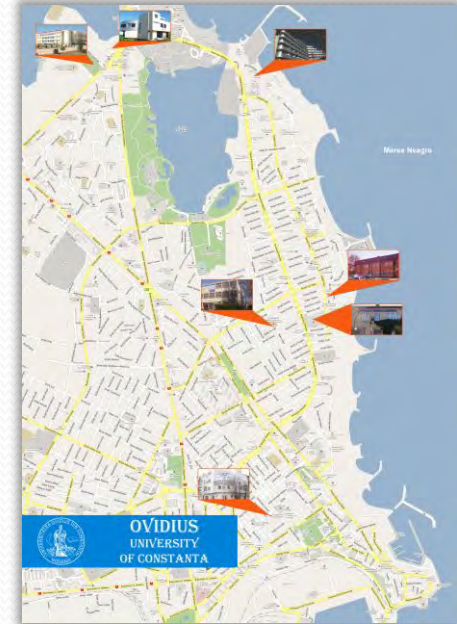
Innovation & Technology Transfer Center

- Area: total ~ 3200 m^2 (4 floors); on ground ~ 800 m^2

- Estimated value: ~ 5 million € (3.6 building + 1.4 equipment)

- Funding: 50% EU Regional funds & 50% OUC funds

Designed with support from IBM Corporate Corps and from local entrepreneurs

http://www.ou.edu/innovationhub

The goal & the challenge ...

Goal:

- Train academics who will use the ITTC in using PBL methods

Challenge:

- design and implement a project-based training course for academics, to involve students from different study programs, working in teams, to solve cross-disciplinary problems, originated from the community

Training course in x-disciplinary PBL

Course design

- **Instructors**:
  - Mihai GÎRȚU – professor pf physics
  - Daniela CAPRIOARA – professor of education
  - Maria MUSCAN – associate professor of German

- **Constraints**:
  - 4 meetings of 4 hours, spread over 4 weeks
  - 6 hours of work outside class
  - 37 trainees (of 82!) divided in 2 classes

- **Venue**:
  - Ovidius Univ. digital library

- **Time planning**:
  - 2 * 100' sessions per meeting
  - 30' max of presentation and min 70' discussion and/or group work per session

- **Basic principle**:
  - 'Walk the talk' – Socratic approach
  - as little theory as possible
  - emphasis on reflection and self evaluation

"I cannot teach anybody anything, I can only make them think."
~Socrates
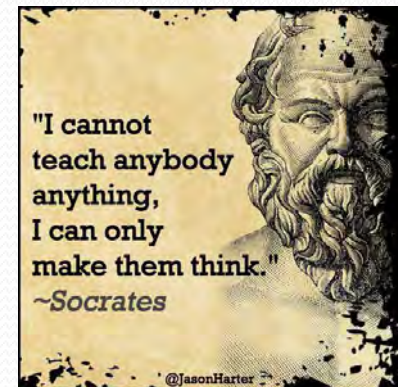
Training course in x-disciplinary PBL

Initial plan

Meeting 1

- Introduce active learning & PBL ✔
- Present overall project topic ✔
- Choose topics & teams ✘✔

... and what actually happened

Meeting 2

- Set learning outcomes ✘✔
- Assess learning needs ✘
- Plan activities ✔

Meeting 3

- Design project evaluation ✔
- Design individual evaluation ✔
- Prepare final presentation ✘

Meeting 4

- Presentation of projects ✔
- Peer evaluation ✘
- Evaluation ✔

1ˢᵗ meeting – Introduction to AL

Meeting 1

- **Introduce AL &PBL**
- Present driving question
- Choose topics & teams

Steps in active learning

1. Driving question
2. Asses existing and necessary knowledge
3. Investigate (observe/experiment/discuss)
4. Describe and explain
5. Extrapolate and predict
6. Share findings

Example from Physics

https://www.youtube.com/watch?v=_eMH07Tghs0

https://qph.fs.quoracdn.net/main-qimg-ad703302df2d186eaf4bf29b86de471e.webp

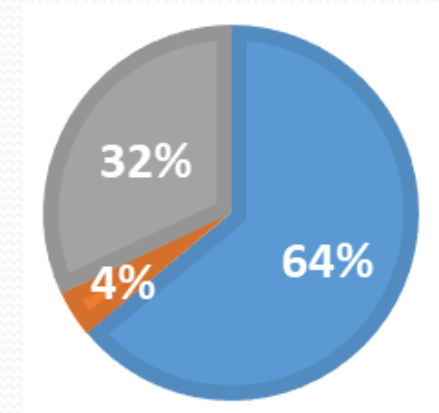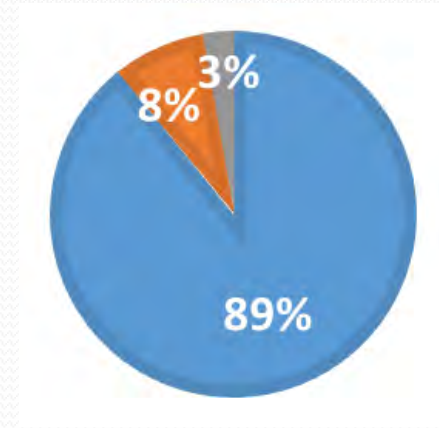*https://www.youtube.com/watch?v=CHQOctEvtTY*

1ˢᵗ meeting – Opinion polls

Mentimeter questionnaires

- Have you used Mentimeter before?
  - No
  - Yes, but not in class
  - Yes, in class with students

- Is it true that student interest is declining?
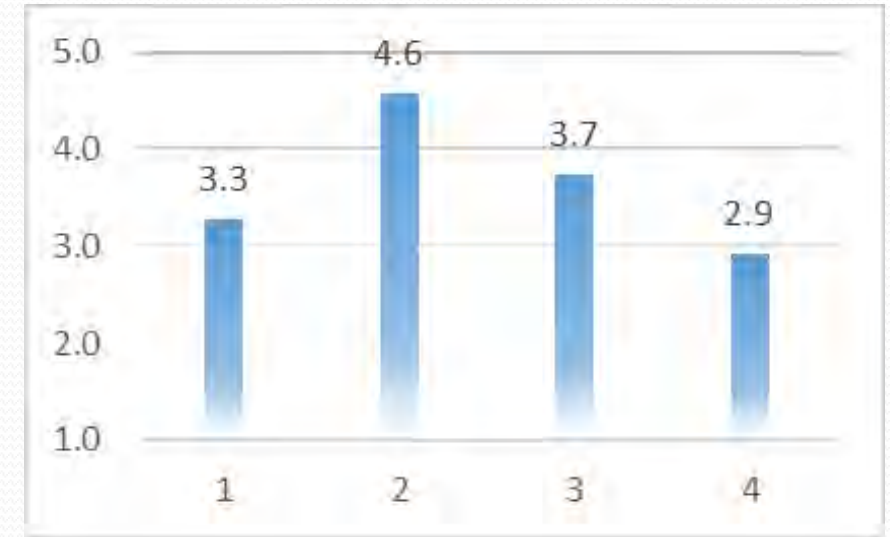 - Yes
  - No
  - Difficult to tell

1st meeting – Opinion polls

Mentimeter questionnaires

- What is the role of the teacher?

  1. Authoritarian   (Lecture style)

  2. Demonstrator   (Coaching style)

  3. Facilitator   (Mentor style)

  4. Delegator   (Moderator style)

Directions from teacher ← → Student's role

Inquiry for confirmation   Structured inquiry   Guided inquiry   Open inquiry

National Research Council - Inquiry and the National Science Education Standards (2000)

https://www.nap.edu/catalog/9596/inquiry-and-the-national-science-education-standards-a-guide-for

1ˢᵗ meeting – Opinion polls

Mentimeter questionnaires

- What teaching methods appeal to your students?

  1. classical lecture
  2. lecture with video projector
  3. demonstration
  4. problem solving
  5. class discussion/debate
  6. project design & implementation
  7. experimentation

  1. 0
  2. 7%
  3. 7%
  4. 20%
  5. 27%
  6. 13%
  7. 27%

1st meeting – Opinion polls

Mentimeter questionnaires

- During a typical activity with students (lasting 50 minutes) for how long do you speak?

  1. about 45 minutes
  2. about 35 minutes
  3. about 25 minutes
  4. about 15 minutes
  5. less than 15 minutes

  1. 3%
  2. 57%
  3. 35%
  4. 5%
  5. 0

Mentimeter questionnaire

Mentimeter

1

http://www.menti.com code ******

1ˢᵗ meeting – The driving question

Meeting 1

- Introduce AL & PBL
- **Present driving question**
- Choose topics & teams

Driving question:

Design a course module using a PBL approach for a discipline that you teach.

The project should be:

- cross-disciplinary: your students should work in teams with students from another class/school, supervised by another academic (2-5 per team)
- finalized in 4 weeks
- presented to and be evaluated by peers

Reflection: Is it / does it …

1. authentic?
2. provocative/motivating?
3. complex/challenging?
4. open ended?
5. address learning outcomes?
6. stimulate teamwork?
7. allow proper assessment?
8. cross-disciplinary?

1st meeting – Choosing topics & teams

Meeting 1

- Introduce AL & PBL
- Present driving question
- **Choose topics & teams**

Exercises for building teams

1. Self introduction
2. Reflection on possible topics
3. Proposal of topics
4. Discussions with peers
5. Topic & team choice

	Social sciences	Humanities and Arts	Life sciences	Applied Sciences & Engineering
Social sciences	🟩	🟩	🟩	
Humanities and Arts	🟦	🟦		🟦
Life sciences	🟥	🟥		🟥
Applied Sciences & Engineering	⬛		⬛	⬛

1ˢᵗ meeting – Choosing topics & teams

Meeting 1

- Introduce AL & PBL
- Present driving question
- **Choose topics & teams**

Challenges for trainees

1. Not familiar with team work
2. Not used to x-disciplinary work
3. Not being acquainted enough
4. Not used to deal with psychological diversity

➔ Patience to build psychologically safe environments

Training course „A transdisciplinary project-based learning approach setting the ground for launching the Ovidius University Innovation and Technology Transfer Center"

Professor Mihai Gîrțu, Professor Daniela Căprioară, Associate professor Maria Muscan

1 – Project description, learning outcomes, learning needs

I.   Project description

Fill in with the information requested	Reflection: Do the information on the left satisfy the criteria below?	👍	👎	❓
Project team: 1. 2. 3. 4. 5.	Is the project team transdisciplinary?			
Project title:	Is the project topic authentic (*inspired from reality*)?			
	Is the project topic provocative (*able to motivate/interest students*)?			
Short description of the project (including the goal and the final product envisaged):	Is the project topic adequate to the level of study?			
	Ia the project topic open (*allows for diverse solutions*)?			
	Is the project topic transdisciplinary?			

2nd meeting – Learning outcomes

Meeting 2

- **Set learning outcomes**
- Assess learning needs
- Plan activities

OECD (2018) The future of education and skills *Education 2030*

https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf

2nd meeting – Learning outcomes

Meeting 2
- **Set learning outcomes**
- Assess learning needs
- Plan activities

Challenges for trainees

1. Not familiar enough with learning outcomes

2. Not familiar with methods to develop soft skills

➔ Examples of good practice much more useful than theoretical approaches

II. Learning outcomes				
Fill in with the information requested	**Reflection:** **Do the information on the left satisfy the criteria below?**			?
Knowledge and professional skills (,hard skills') to be developed:	Does the project stimulate students to acquire the knowledge and professional skills envisaged?			
	Does the project allow the assessment of the knowledge and hard skills acquired?			
Soft skills to be developed:	Can the project activate the knowledge previously acquired and the self-evaluation of the learning needs?			
	Can the project stimulate the ability to use credible and diverse information sources?			
	Does the project train the students to ask questions, discuss based on arguments and facts and to take decisions?			

2ⁿᵈ meeting – Planning

Meeting 2

- Set learning outcomes
- Assess learning needs
- **Plan activities**

Planning

- Activities
- Methods used
- Deliverables

Challenges for trainees

1. Assessing the time needed
2. Selecting diverse teaching methods
3. Choosing appropriate deliverables

➔ Discussions and sharing of experience very useful

I.   Work plan

Week 1		Week 2		Week 3		Week 4	
Activity	Methods used	Activity	Methods used	Activity	Methods used	Activity	Methods used
Deliverable:		Deliverable:		Deliverable:		Deliverable:	

Reflection: Does the information provided in the previous table satisfy the criteria below?			
Is the sequence of activities logical? Are those activities well correlated with the goals set?			
Is the project timeline realistic? Does it allow the completion of the goals set?			
Can the methods proposed to be used insure that the goals will be met?			
Are the proposed deliverables relevant for the topic?			
Can the proposed deliverables demonstrate student progress?			

2nd meeting - Planning

Meeting 2

- Review learning outcomes
- ~~Assess learning needs~~
- **Plan activities**

Roles

- Facilitator (moderator)
- Recorder & timekeeper
- Reporter
- Innovator (enthusiast)
- Challenger (skeptic)

II. Roles and responsibilities

Activity	Team member	....	....	....	....	....

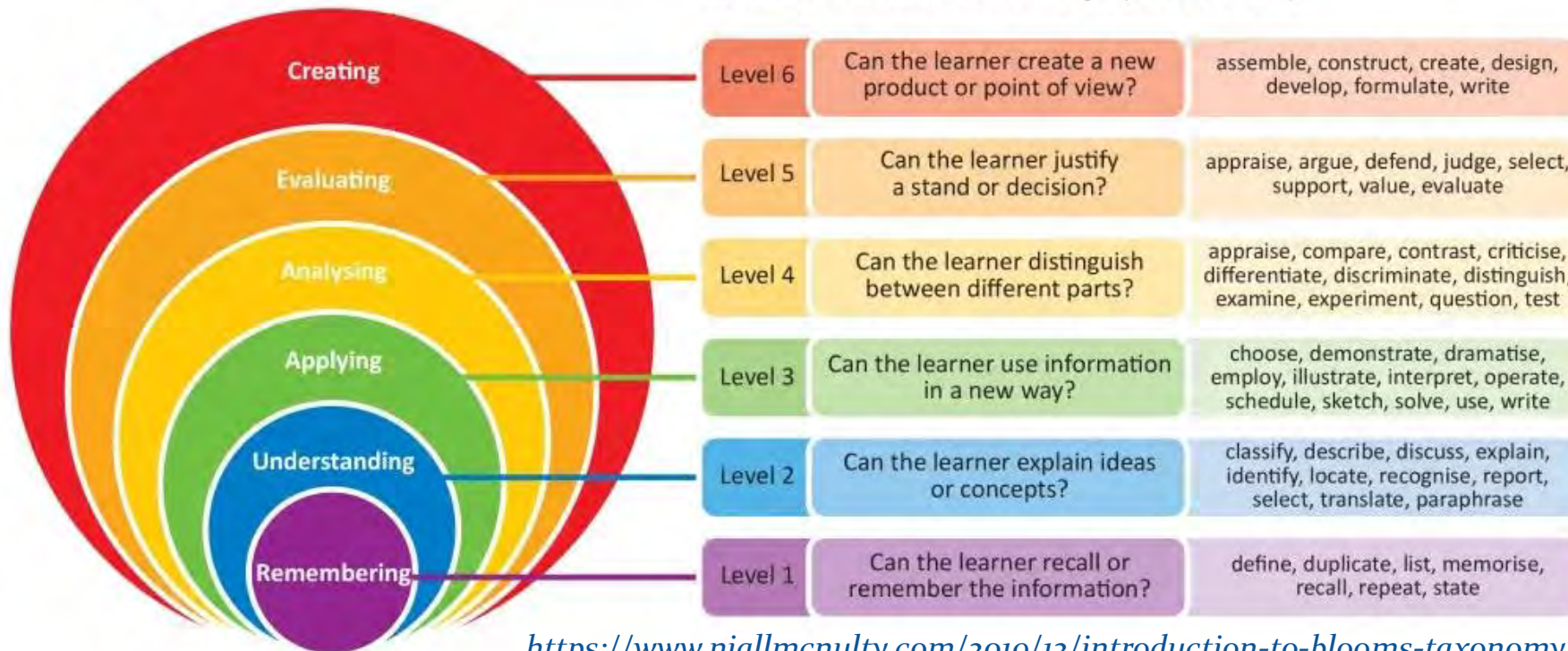| Reflection: Does the information provided in the previous table satisfy the criteria below?	👍	👎	❓
Is the allocation of roles and responsibilities balanced among team members?			
Is the allocation of roles and responsibilities in accordance with the team member personality?			
Is the allocation of roles and responsibilities in accordance with the team member expertise?			

3rd meeting – Design the evaluation

Meeting 3

- **Design project evaluation**
- **Design individual evaluation**
- Prepare final presentation

Bloom's taxonomy (revised)

Level 6	Can the learner create a new product or point of view?	assemble, construct, create, design, develop, formulate, write
Level 5	Can the learner justify a stand or decision?	appraise, argue, defend, judge, select, support, value, evaluate
Level 4	Can the learner distinguish between different parts?	appraise, compare, contrast, criticise, differentiate, discriminate, distinguish, examine, experiment, question, test
Level 3	Can the learner use information in a new way?	choose, demonstrate, dramatise, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write
Level 2	Can the learner explain ideas or concepts?	classify, describe, discuss, explain, identify, locate, recognise, report, select, translate, paraphrase
Level 1	Can the learner recall or remember the information?	define, duplicate, list, memorise, recall, repeat, state

Creating · Evaluating · Analysing · Applying · Understanding · Remembering

https://www.niallmcnulty.com/2019/12/introduction-to-blooms-taxonomy/

- Peer evaluation within each team
- Peer evaluation of the project/team
- Teacher evaluation
  1. Project/team
  2. Individual (knowledge & hard skills + soft skills)

Meeting 3

- **Design project evaluation**
- **Design individual evaluation**
- ~~Prepare final presentation~~

Challenges for trainees

1. Formulating attainment descriptors (for assigning grades)
2. Evaluating contribution in team work

➔

Provide examples & guidance

I. Project evaluation

Criteria for project evaluation

Criterion	Assessment
Project topic Authenticity of the project topic; Relevance of the topic with respect to the challenge	
Project management planning (including the goals set and the role and responsibility allocation), execution (quality of activities performed, of methods used, punctuality, teamwork), evaluation (self-assessments)	
Project solution/results Difficulty of the project topic and novelty of the solution; Quantity and quality of deliverables; Outcomes and potential impact	
Final presentation Content and organization of the presentation, format of the presentation (including illustrations & visual aids, bibliography etc.), delivery of the presentation (clarity, pace/rhythm, timing, interaction with the audience), quality of answers offered	

Assess with: E (excellent), G (good), F (fair), P (poor).

Attainment descriptors for project evaluation

Criterion \ Rating	Poor	Fair	Good	Excellent
Project topic: *Authenticity and relevance of the topic with respect to the challenge*	Students propose an imaginary topic, with no clear connection to reality. The project topic has no relevance to the challenge.	Students propose a topic deriving from real world problems but have difficulties in setting measureable goals or the goals are weakly correlated with the challenge.	Students propose a topic deriving from the real world and can set precise, measurable goals, which are relevant to and well correlated with the challenge.	Students propose a topic of high, current interest, which derives from real world problems. They can set goals that are not only precise and measurable but also ambitious. Also, the goals are relevant to and well correlated with the challenge.
Project management:				

Challenges for trainees

1. Formulating attainment descriptors
2. Setting criteria for assessing soft skills
3. Setting weights to various criteria

➜

Provide examples & guidance

Attainment descriptors

Rating Criterion	Poor	Fair	Good	Excellent
The ability to activate the knowledge already acquired and to evaluate the learning needs	The student cannot identify previous information relevant to the subject and cannot activate previous knowledge in order to approach the project. He/she has major difficulties in determining what he knows and what he has to learn.	The student can remember the previously accumulated information and basic concepts but has difficulties in connecting previous knowledge to the present project. He/she identifies the existing knowledge but has difficulty assessing the learning needs or to prioritize them. The student can explain at least some of the choices made.	The student can remember the concepts accumulated previously and can connect them to the project. He/she is capable of establishing suitable learning needs, of distinguishing the key concepts and can establish priorities. The student can not only explain but also defend with arguments the choices made.	The student can recall the prior knowledge and can not only connect it easily to the given topic but can also explain and interpret on the relation with well-justified arguments. He/she establishes ambitious learning needs, choosing to deepen knowledge. The student is able to distinguish the key concepts and set priorities, can defend with sophisticated arguments the choices made, and can creatively develop a well thought study plan.
The ability to use diverse and reliable sources of information				

IV. Final grade calculation

Weight of peer evaluation of the project & entire team:

Weight of teacher evaluation of the project & entire team:

Weight of team member evaluation of student's contribution:

Weight of teacher evaluation of student's contribution:

Weight of teacher evaluation of student's knowledge and professional skills:

4th meeting – Presentation & evaluation

Meeting 4
- **Presentation of projects**
- ~~Peer evaluation~~
- **Evaluation**

Evaluation criteria The trainees can	E	G	F	P
Describe, explain and interpret the fundamental concepts of active learning	12	15	7	3
Use active learning concepts to design a x-disciplinary PBL teaching module	9	13	12	3
Use real-time online questionnaires to verify knowledge and collect opinions	0	16	18	3
Work in cross-disciplinary teams and guide student teams	11	13	10	3
Design and implement complex, multi-criterial evaluation methods: *i*) hard skills,　*ii*) soft skills,　*iii*) quality of project & teamwork	9	15	10	3

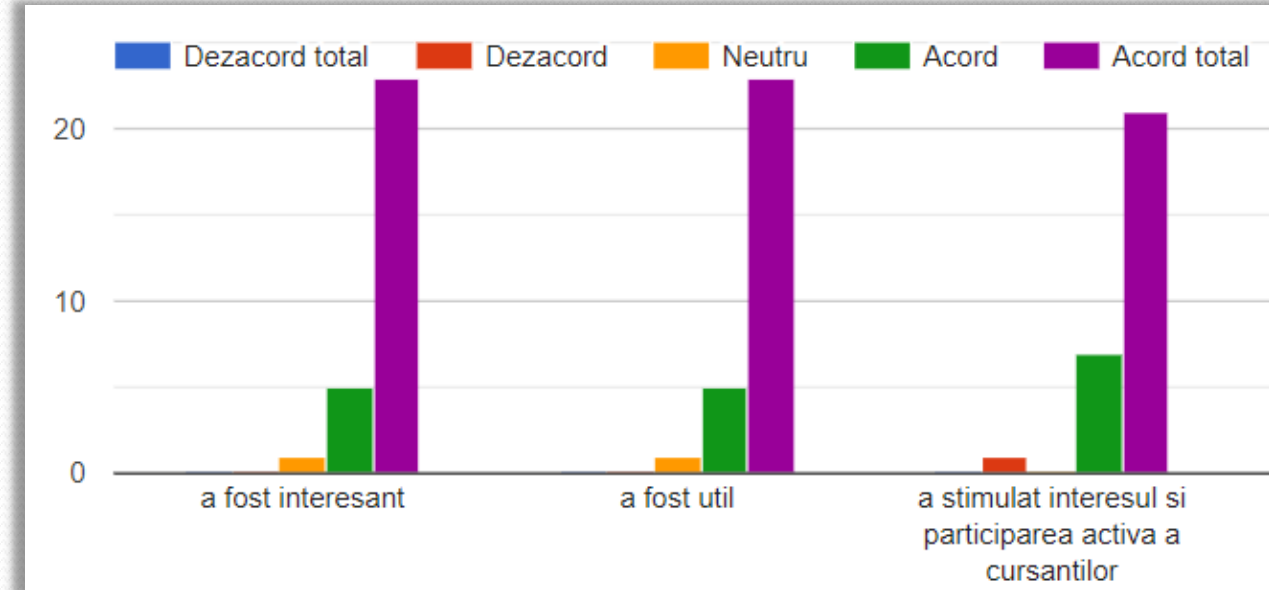# Response to feed-back questionnaire

Challenges

- Identifying appropriate team partners
- Working in heterogeneous teams
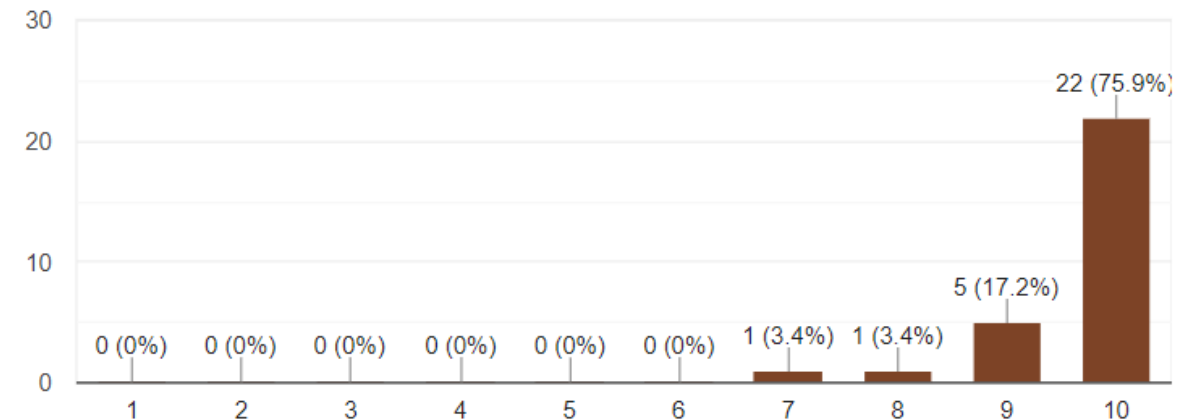- Filling up the forms
- Irregular attendance

Suggestions

- Continue with such courses
- Allocate more time
- Introduce more examples and interactive games

Conclusions

- Academics are aware that a change in teaching methods is necessary. However …

Teacher's perspective:

- Skepticism (yet another 'reform')
- More effort to prepare classes
- More difficult class management
- More time consuming
- More complicated assessment
- Lack of infrastructure/equipment
- Lack of familiarity with online platforms

Student's perspective

- Reluctant to do more work
- Unhappy with team work
- Confused by assessment
- Discontent with infrastructure

The way forward

Administrator's perspective:

1. Prepare the change

   - Build a team of supporters (academics, students, employers)

   - Plan for a gradual transition
     - Train academics
     - Pilot, first with enthusiasts
     - Allow academics and students the time to adjust

   - Design packages of incentives

   - Encourage the use of online platforms → EBT

2. Support the change

   - 'Walk the talk' with patience and persistence
   - Build long term support systems

Teacher Training Department
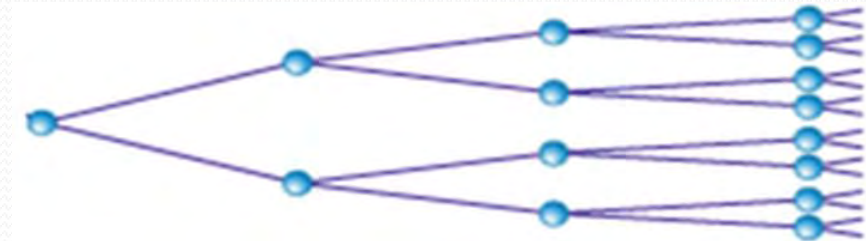
Ovidius University
15 → 700 academics → 15000 students

Constanta county
15 → 6000 teachers → 60000 students

Accept partial failure and persist to improve the teaching methods!
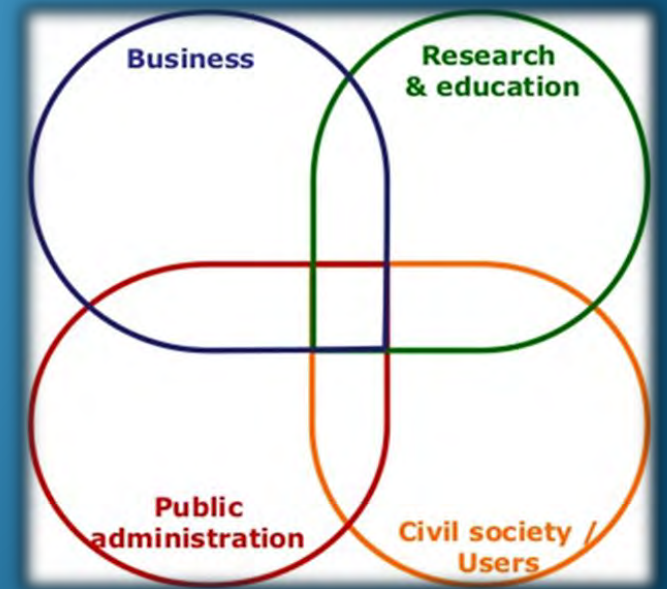
Mentimeter questionnaire

Mentimeter

2

http://www.menti.com code ******

Thank you
for your attention!

Mihai A. GÎRȚU
Daniela CAPRIOARA
Maria MUSCAN

mihai.girtu@univ-ovidius.ro
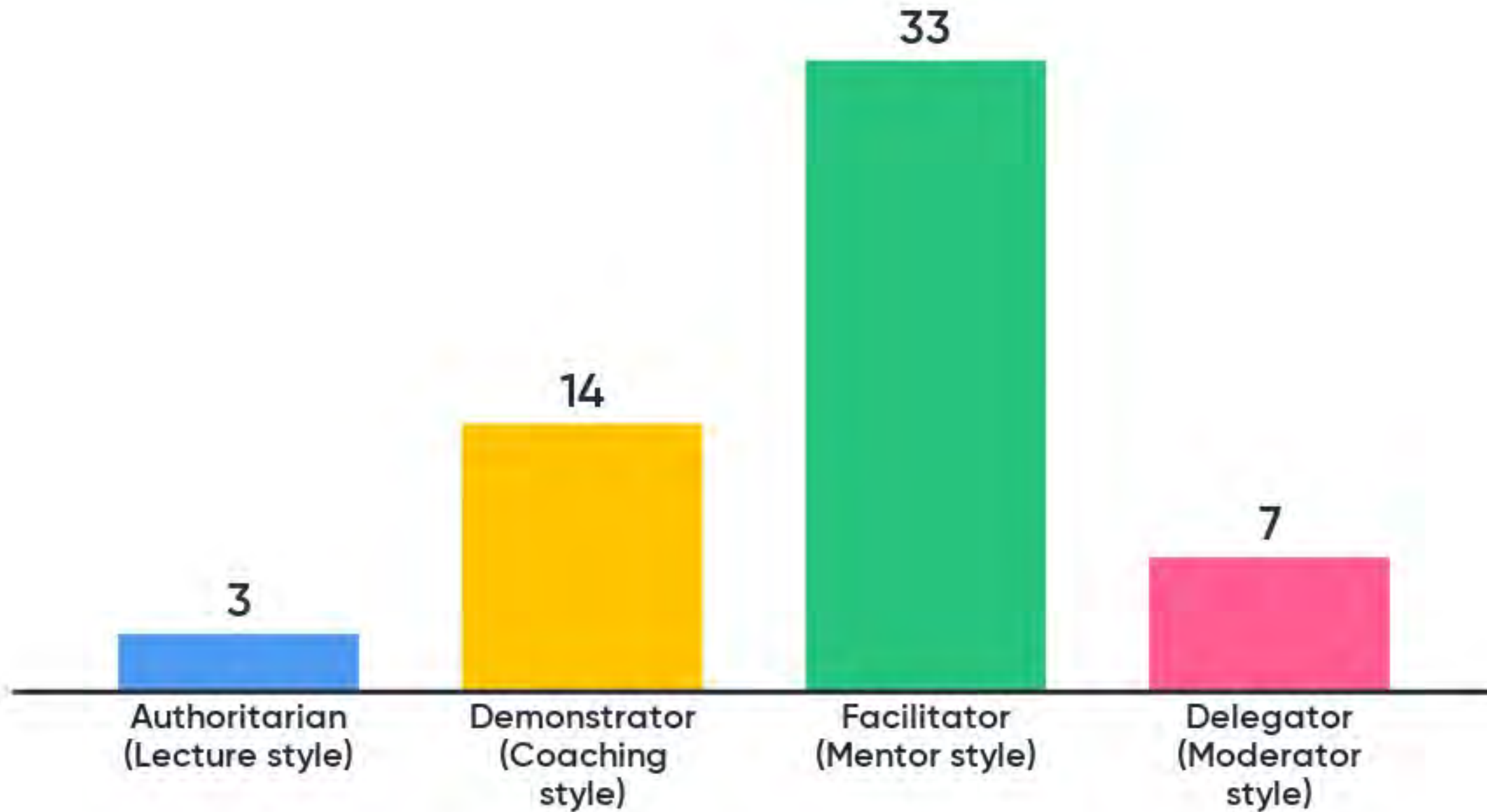
In your institution, how extensive is the use of ...

Strongly disagree — Strongly agree

- active learning methods, in general — **3.4**
- inquiry-based methods — **2.8**
- problem-based methods — **2.9**
- project-based methods — **3.2**

👤 53

How extensive is the use of ...

Strongly disagree — Strongly agree

- Kahoot — 1.7
- Mentimeter — 1.7
- Google classroom — 1.7
- Blackboard — 1.8
- Moodle — 3.5
- Canvas — 1.9

👤 48
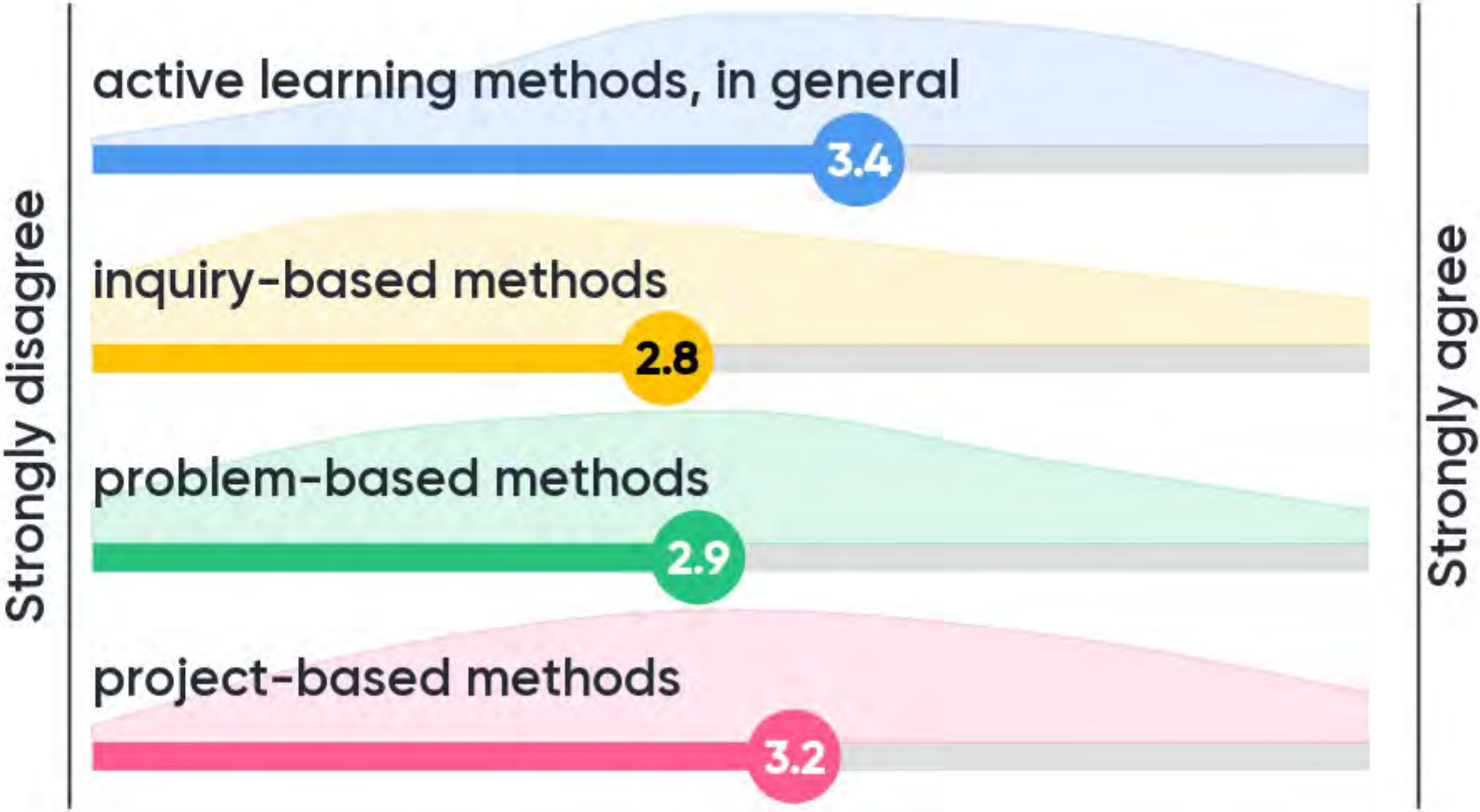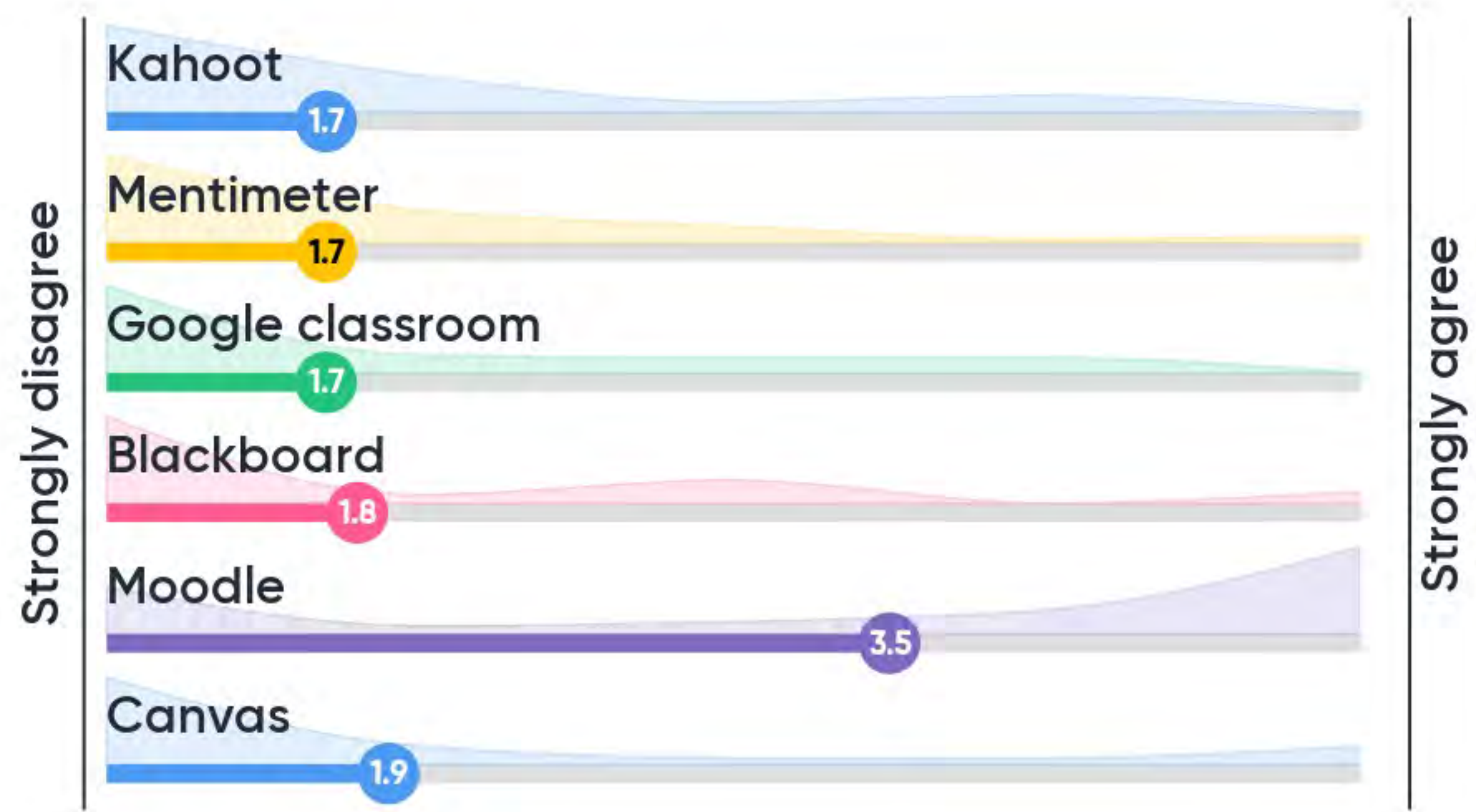
Rate the following obstacles (teacher's perspective):
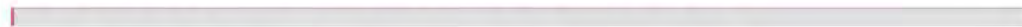
teacher's reluctance to change

effort to prepare class activities
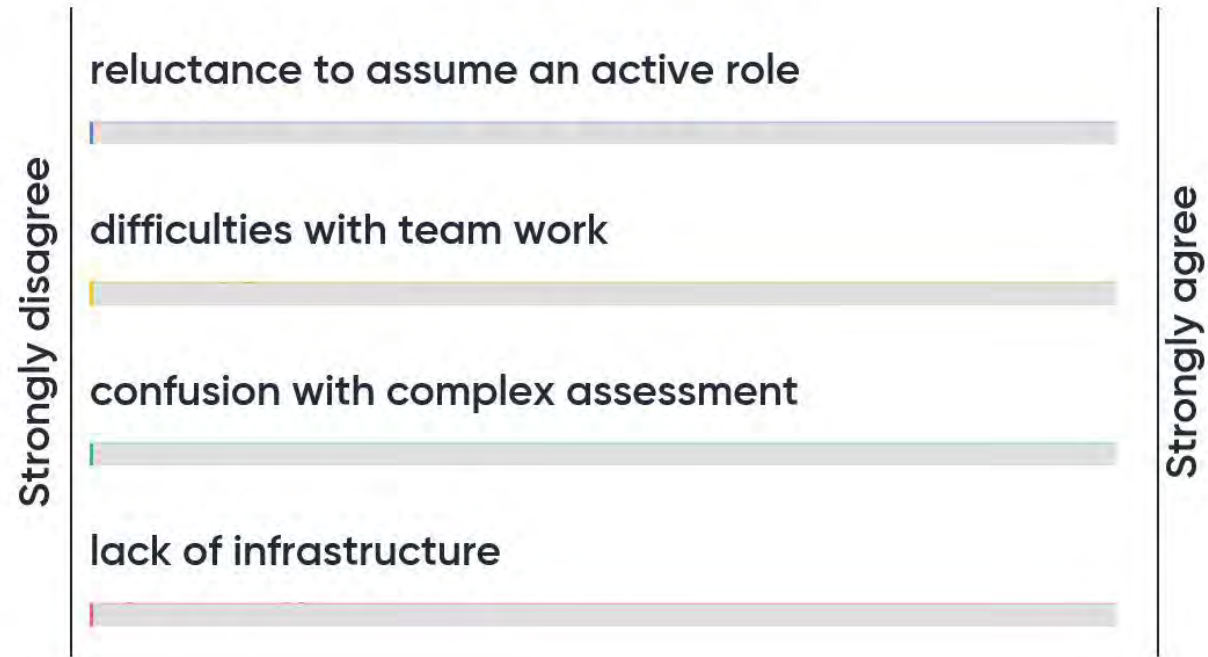
difficulty of class management

not enough time to cover all material

complicated assessment

Rate the following obstacles (student's perspective)

reluctance to assume an active role

difficulties with team work

confusion with complex assessment

lack of infrastructure

Strongly disagree

Strongly agree

Rate the effectiveness of the following measures

include use of teaching methods in anual evaluation

include use of teaching methods in promotion criteria

offer rewards and recognition

empower teaching and learning office

Strongly disagree

Strongly agree

Suggest a way to stimulate the use of active learning methods