Report “Question-Driven Learning in STEM” Summer School

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In recent years, many universities have made student-centered learning a common priority, embedding it in professional development initiatives for academic staff. Although active learning approaches and the use of digital technologies offer substantial advantages, lecturers continue to encounter obstacles when applying methods such as effective questioning or promoting collaboration among students. Consequently, traditional lecturing still tends to dominate, especially in large cohorts and more conventional classroom environments.

To support academic teachers and program directors in navigating these challenges, the ECTN WG Eurolecturer Academy started short 2.5-day Summer Schools on “Teaching and Learning in Higher Education STEM”, which aim to explore a specific educational theme within the STEM disciplines (Science, Technology, Engineering, and Mathematics), equipping participants with innovative approaches and practical tools for effective teaching. After the success last year in Krakow, the 2026 summer school on “Question-Driven Learning in STEM” was given for the second time in Valencia. The summer school from 19–21 May was a pre-event of the ECTN Annual meeting and General assembly held at the same location from 21–23 May 2026.

The ECTN “Teaching and Learning in Higher Education STEM” Summer Schools, build up on the ECTN tradition of organizing summer schools started with “Newly Appointed University Chemistry Teaching Staff – Summer School, Malta, Sliema” held from June 22–29, 2005, and June 12–16, 2007. Many who attended those events now hold high academic positions.

1. Organization "Question-Driven Learning in STEM" Summer School

The "Question-Driven Learning in STEM" Summer School 2026, was organized by the ECTN Working Group Eurolecturer Academy in collaboration with the local organizing institution, the Faculty of Chemistry, University of Valencia. The location of the summer school was Faculty of Science building.

Summer School venue: University of Valencia, Burjassot campus, Faculty of Chemistry (photo left), monument in front of the university restaurant where lunches were held (photo right).

Organizing Committee: Prof. Dr. Rafael Ballesteros Garrido (University of Valencia), Dr. Daniel Tordera (University of Valencia), Dr. Natasa Brouwer (University of Amsterdam, The Netherlands ECTN WG Eurolecturer Academy), Prof. Iwona Maciejowska (Jagiellonian University in Krakow, Poland, ECTN WG Eurolecturer Academy), Prof. Sanjiv Prashar (University Rey Juan Carlos, Madrid, Spain)

Scientific Committee: Dr. Natasa Brouwer (retired), University of Amsterdam, The Netherlands, Prof. Iwona Maciejowska, Jagiellonian University in Krakow, Poland, Dr. Claire McDonnell, School of Chemical & BioPharmaceutical Sciences, Technological University Dublin, Ireland, Prof. Dr. Livia Simon Sarkadi, Hungarian University of Agriculture and Life Sciences, Budapest, Hungary

Developers Team: Mauro Mocerino (Curtin University, Perth, Australia), Brit Giesbertz (University of Amsterdam, The Netherlands), Iwona Maciejowska (Jagiellonian University in Krakow, Poland), Natasa Brouwer (University of Amsterdam, The Netherlands).
Educators Valencia 2026: Mauro Mocerino (Curtin University, Perth, Australia) and Natasa Brouwer (University of Amsterdam, The Netherlands)[1]

Participants: in total, nineteen participants from six different higher education institutions in five European countries took part in the intensive program of the "Question-Driven Learning in STEM" Summer School. Ten participants came from the University of Valencia.

Extent: The "Question-Driven Learning in STEM" Summer School comprises 20 contact hours, and the effort required is equivalent to 1 ECTS credit

Recognition: The "Question-Driven Learning in STEM" Summer School by ECTN is recognized by EuChemS.

For teaching and learning materials, the "Question-Driven Learning in STEM" Summer School utilized an online course on the electronic learning platform ***Aula virtual UV*** (Moodle) from University of Valencia. For socializing and quick information sharing, the summer school utilized a WhatsApp group.

The Summer School started on Tuesday 19th May at 10.30 in the morning with an icebreaking and networking event and concluded on Thursday, 21st May at noon with the participants' presentations of

[1] Due to work and personal circumstances Iwona Maciejowska and Brit Giesbertz unfortunately couldn't join in Valencia in person

their teaching designs, reflections, and a certificates ceremony. There was a social dinner on Wednesday, 20th May, at a restaurant serving typical Spanish food in the historical city center of Valencia. Before the social dinner, the participants who were not from Valencia enjoyed the inspiring guided tour through the old city of Valencia given by Rafael Ballesteros Garrido (local organizer) and Kassio Zanoni (one of the participants of the summer school from Valencia). See the final programme of the summer school in the Appendix.

Tuesday, 19th May: Icebreaking event

Tuesday, 19th May: Opening of the "Question-Driven Learning in STEM" Summer School

Prof. Rafael Ballesteros Garrido from the local organizing team opened the "Question-Driven Learning in STEM" Summer School in Valencia and introduced the Dean of the Faculty of Chemistry, University of Valencia, Prof. Rafael Ibáñez Puchades, who welcomed the participants during a short opening ceremony. Prof. Sanjiv Prashar (General Secretary of the ECTN and member of the summer school Organizing Committee joined the opening ceremony online.

2. Programme and working approach

Intended learning outcomes: after the "Question-Driven Learning in STEM" Summer School the participants are able to:

- design questions with different goals to implement in their teaching practice
- design a short guided inquiry session for their students
- take a role of a "guide on the side" in a session with students in an inclusive way
- discuss how this type of teaching could be adapted to available teaching facilities
- share experience about the guided inquiry teaching method with colleagues

The summer school had eight sessions that focused on topics associated with teaching through questioning, from basic principles and elements of questioning to complex teaching methods such as Process-Oriented Guided Inquiry Learning (POGIL). The Summer School's teaching/learning approach itself was also question-driven, meaning that participants experienced this type of collaborative learning and co-creation "as students." The presence of Mauro Mocerino on the developers' and educators' team, who has been using the POGIL method in his own teaching practice with students for many years, ensured an authentic and rich learning experience. During the Summer School sessions, participants mostly worked in small groups of three or four, on various assignments related to teaching through questioning.

The 8 sessions were (find the final programme of the Summer School in the Appendix):

Session 1: First steps into developing processing skills

Session 2: Active learning through questioning. Why and What?

Session 3: Designing questions with different goals

Session 4: Diversity and inclusion in question-driven teaching

Session 5: POGIL session: Designing guided inquiry session

Session 6: Hands-on working discussion and preparing of presentations

Session 7: Presentations participants and discussion

Session 8: Wrap-up Summer school and take-home messages. Closing Ceremony and certificates

Wednesday, 20th May: Group work

Wednesday, 20th May: Group work

In Session 4, diversity and inclusion in question-driven teaching were discussed using a carousel collaboration approach. Each of the five groups defined a potential diversity and inclusion risk situation that can arise when we use highly interactive guided-inquiry teaching methods or POGIL and let the neighboring group find a solution to tackle it in the classroom. This resulted in posters that triggered further discussion.

Hands-on Session 6 was devoted to the development of participants' guided-inquiry teaching units/POGIL units to use in their own teaching practice. For inspiration, Daniel Tordera, who participated in the 2025 summer school in Krakow, presented his POGIL unit, the pedagogical reasoning behind it, and his experiences from his own teaching practice with it. Additionally, on the Moodle platform, participants could find a series of POGIL units developed by Mauro Mocerino for his own courses.

Wednesday, 20th May: Daniel Tordera presenting his POGIL unit

In Session 6, participants also discussed the reasoning behind their units in small groups with colleagues who had chosen similar content and prepared their presentations for Session 7 on Thursday morning. Before leaving the room on Wednesday, all participants had their short guided-inquiry teaching units/POGIL units ready to be presented the next day. This made it possible for the participants to enjoy the social event: a guided tour through the old city of Valencia and a social dinner.

University of Valencia campus park with palms and flowering jacarandas; the canteen and monument in the background.

On Thursday morning, 21st May, the participants presented their guided-inquiry/POGIL units individually or in groups, depending on the topic relevant to their teaching practice.

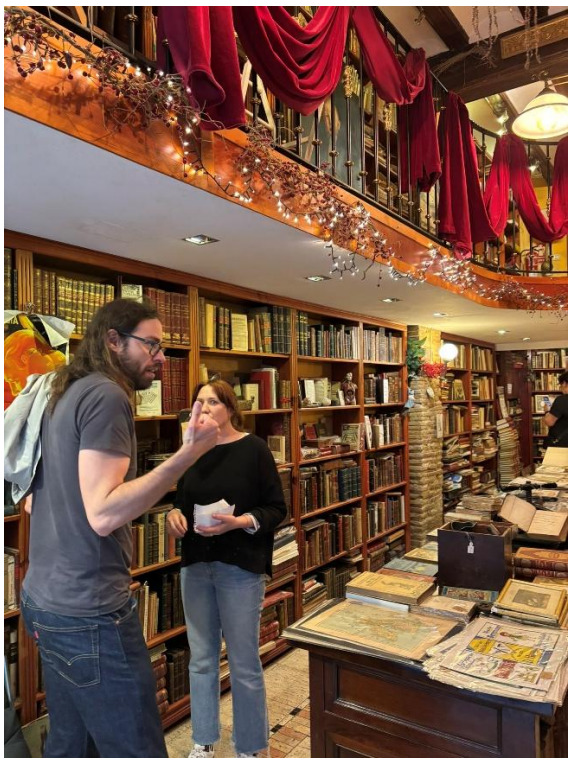
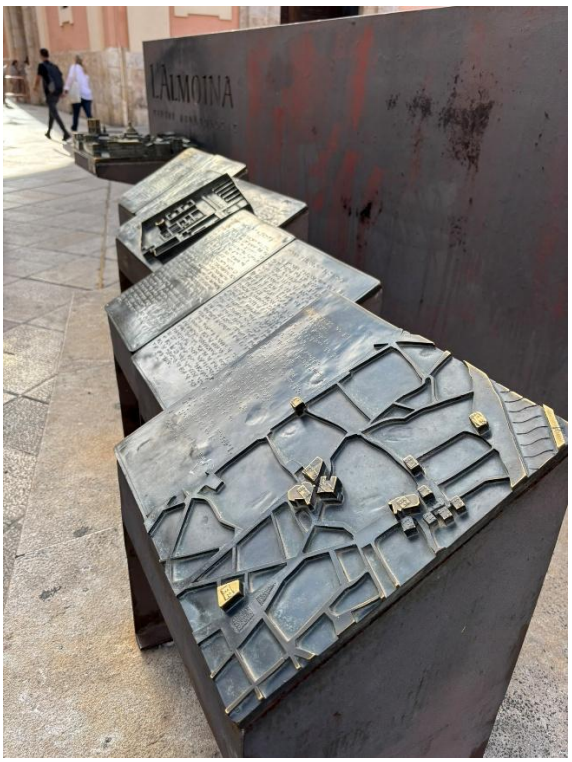
Thursday 21th May: Presentations of participants

3. Facilities and social part of the "Question-Driven Learning in STEM Summer School

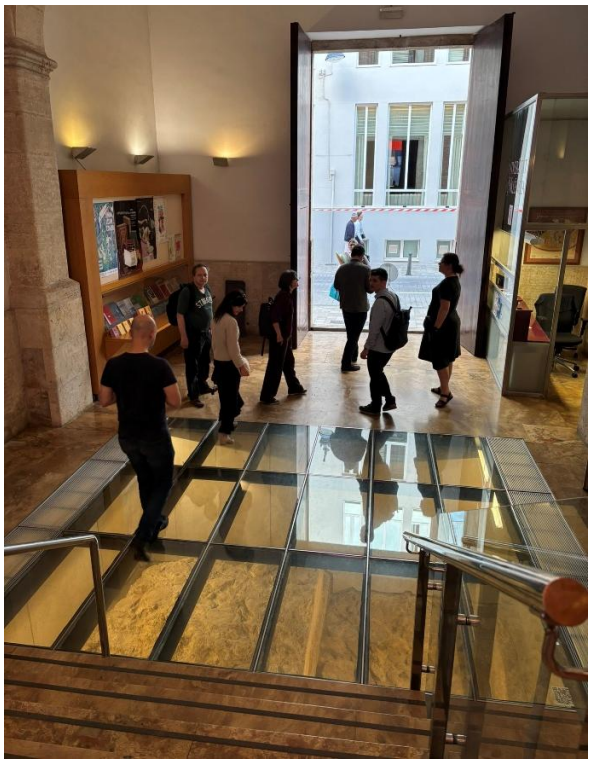
Between the sessions, coffee breaks were served in the faculty outside the working room. Lunch was served in the university canteen that is just next to the faculty building.

Lunch and coffee breaks featured delicious Spanish food and treats. During the last coffee break on Thursday morning, the sponsor of the "Question-Driven Learning in STEM" Summer School, LearnSci, inspired the participants with their tool.

“Question-Driven Learning in STEM” Summer School - Group picture in front of the monument in the campus park

Old city of Valencia, where cars are not allowed behind the city port anymore. Bottom right: city map for visually impaired people.



Old building of the University of Valencia from 1493, still in use by university for special activities

Social dinner in the restaurant in the old city centre of Valencia with typical Spanish food

4. Reflection and Certificates ceremony

During the Summer School, there was ample space for reflection. The last session of the Summer School was devoted to take-away messages and awarding of certificates.

Take-away messages:

- keep open mind
- use it!
- let them create the idea
- group working is inspiring
- we should change <= students have changed
- students can think by themselves
- combine strategies
- process is important
- change teaching
- make time to try it out
- didactics is good for students
- we can be more inclusive with POGIL
- maybe it will work
- it improves lecturer and student
- the best teachers develop

- start general and deepen
- it can be fun
- learning in group can be more effective
- how to teach basic concepts
- changing the rule

Thursday 21st May: certificates ceremony

Appendix: Final programme "Question-Driven Learning in STEM" Summer School

Programme

"Question-Driven Learning in STEM" Summer School, Valencia 2026

Tuesday, 19th May				
10³⁰–11⁰⁰	Walk in Registration			
11⁰⁰–13³⁰		*Ice-breaking and networking event. Introduction to the school (lunch included)*		
13³⁰–13⁴⁵		*Greeting by Local Organizing University*		
13⁴⁵–15¹⁵		*Session 1*	*First steps into developing processing skills*	Mauro Mocerino & Iwona Maciejowska
15¹⁵–15³⁰	Coffee break			
15³⁰–17⁰⁰		*Session 2*	*Active learning through questioning. Why and What?*	Mauro Mocerino & Natasa Brouwer
	Free evening			

Wednesday, 20th May				
8⁴⁵–9⁰⁰	Walk in			
9⁰⁰–10³⁰		*Session 3*	*Designing questions with different goals*	Mauro Mocerino & Iwona Maciejowska
10³⁰–10⁴⁵	Coffee break			
10⁴⁵–12¹⁵		*Session 4*	*Diversity and inclusion in question-driven teaching*	Brit Giesbertz & Natasa Brouwer Mauro Mocerino
12¹⁵–13¹⁵	Lunch break			
13¹⁵–15⁰⁰		*Session 5*	POGIL session: *Designing guided inquiry session*	Mauro Mocerino & Iwona Maciejowska Brit Giesbertz Natasa Brouwer
15⁰⁰–15¹⁵	Coffee break			
15¹⁵–16⁴⁵		*Session 6*	*Hands-on working discussion and preparing of presentations*	Mauro Mocerino Natasa Brouwer
16⁴⁵–17⁰⁰		*Day Wrap-up*		
20⁰⁰–22⁰⁰	Social Dinner			

Thursday, 21st May				
8⁴⁵–9⁰⁰	Walk in			
9⁰⁰–11⁰⁰		*Session 7*	*Presentations participants and discussion*	Mauro Mocerino Natasa Brouwer
11⁰⁰–11¹⁵	Coffee break			
11¹⁵–12⁰⁰		*Session 8*	*Wrap-up Summer school and future plans* *Closing Ceremony Summer School Question-Driven Teaching*	Mauro Mocerino Natasa Brouwer