Developing new habits for Physics teachers through Creative Ateliers

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INTRODUCTION

Recent research in Physics Education shows teachers worldwide how a modernization of techniques and strategies is necessary. Many different approaches and models are being employed to transmit content to our students, and all present the same challenge: instructing teachers to utilize them effectively and making them the habitual choice.

A Creative Atelier is a pedagogical environment where creativity is used to scaffold learning processes. They are mainly used to help children learn and were born in Reggio Emilia's preschools [1].

Expanding the Reggio Emilia experience with Creative Ateliers to in-service Physics teachers, we organized a course called "Creative Atelier for Physics Exercises and Problems" to provide our participants with new tools for in-class teaching.

We embraced the theoretical framework for teachers' training programs DHAC (Development of Habits through Apprenticeship in a Community) [2] to develop a training course based on the concept of the Creative Atelier.

We built the contents and materials of our course looking at the ISLE (Investigative Science Learning Enviroment) framework, particularly the use of non-traditional problems, the definition of scientific abilities and the use of rubrics for assessment [3, 4,5].

OBJECTIVES

review the Italian and European requests to Physics high school teachers on competencies and scientific skills

compare these requests with the scientific abilities defined by the ISLE approach

→ build a correspondence between the two

organize a teacher training program →

- provide our teachers with new tools to develop and assess scientific competencies
- help Physics teachers develop new productive habits to employ in their teaching practice

the two habits we focused on developing are:

USING NEW NON-TRADITIONAL TYPES OF PROBLEMS AND EXERCISES (ISLE-based)

USING FORMATIVE ASSESSMENT IN THE EVALUATION PROCESS

METHODS

THE COURSE:

The Creative Atelier took place in Trieste, Italy and it was hosted by the Physics Department of University of Trieste.
All the materials created for (and during) the program are immediatly available in Italian. Translated materials will be distributed to anybody interested.

- Hybrid mode: both in-presence and online.
- Thirty nine attendees, some teachers, some students.
- Five meetings, 3 hours long.
- Between November 2023 and January 2024.
- Two non-traditional problem types each meeting.
- Group work for every problem type, after having viewed and discussed multiple examples:

Distribution of the location of the Atelier's participants.

start with a traditional problem, taken from an Italian high school textbook

solve the starting problem and identify useful information

build the new, non-traditional problem with the characteristics of the chosen type

give the problem to a different group, that solves it

share observations with everyone

finalize the problem's construction

to help our teachers develop new productive habits we aimed to change their

DISPOSITIONS	SKILLS	KNOWLEDGE
Recognize non-traditional problems as useful tools to develop scientific abilities. See the necessity of formative assessment.	Know how to use the new ten problem types and how to evaluate a solution using rubrics.	Know and understand what European and Italian authorities ask Physics teachers. Be aware of the existence of different exercises.

THE DATA:

QUANTITATIVE

Exercises and problems produced during the Creative Atelier: 24 problems of different types

Responses to a final evaluation questionnaire: 19 responses

QUALITATIVE

Observations and comments made by the attendees during the meetings, transcripted thanks to the video recordings.

The material is not reported here because it is in Italian.

To find out more, CONTACT US!

THEORETICAL FRAMEWORK

DHAC
Development of Habits though Apprenticeship in a Community

a teacher's habits have their roots in

DISPOSITIONS	SKILLS	KNOWLEDGE
are one's beliefs and attitudes related to some aspects of teaching.	relate to techincal and emotional abilities that a teacher needs to lead a lesson.	of what to notice, how to act, which behaviours to stop and which to encourage.

to develop new habits, a teacher's training program has to include

a. Practice-based apprenticeship: the attendees need to observe reformed teaching practice and then slowly start taking part in it. Instructors have to guide the attendees and provide rapid feedback, before gradually assigning more independent work.

b. Coursework on the learning and teaching of Physics: knowledge of subject-specific content is not enough for a teacher. A teacher training program needs to focus on the learning process, topic-specific and general tools and tasks.

c. Care and feeding of a community of physics teachers.

ISLE scientific abilities and non-traditional Problems and Excercises

SCIENTIFIC ABILITIES

1. Multiple representation
2. Devise and test and explanation (or relationship)
3. Account for anomalous data
4. Design an experiment
5. Record, represent and analyze data
6. Evaluate predictions, claims and models
7. Communicate

assessed using rubrics.

non-traditional PROBLEMS

1. Ranking task
2. Choose answer and explanation
3. Choose measuring procedure
4. Evaluate
5. Make judgment based on data
6. Linearization
7. Multiple possibility and tell all
8. Jeopardy
9. Design an experiment (or pose a problem)
10. Problem based on real data

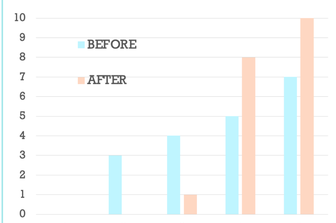
We followed Šarlah and Planinšič's paper "*Designing new types of problems using peer-reviewed papers*" to transform traditional problems in new ones. The process we used is:

Solve the original exercise → **Deconstruct** the solution → **Build** the new problem → **Solve it** → ask for **feedback**

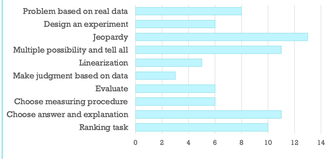
PRACTICE-BASED APPRENTICESHIP
COURSEWORK ON THE LEARNING PROCESS
COMMUNITY OF TEACHERS
to change →
DISPOSITIONS
KNOWLEDGE
SKILLS
to develop →
NEW PRODUCTIVE HABITS

FINDINGS AND CONCLUSIONS

Value given to scientific abilities and their assessment BEFORE and AFTER participating in the Atelier:
(1-very little; 5-a lot)



Interest demonstrated to the different types of non traditional problems:



When we [teachers] prepare tests, we often look for, as the students say, the exercises "with more stars", i.e. more difficult ones. Perhaps that's because we think that the more complex ones can show us how much and what a student has understood. I now realize that even the simpler ones, for example some of the types we have seen, can make the student reflect and identify the conceptual knots.
Observation made by a high-school teacher after having participated in the Creative Atelier, translated from Italian.

- Both ISLE experts and newcomers appreciated the Creative Atelier experience.
- We uncovered that almost half of the teachers don't habitually use tools to assess scientific competencies.
- We detected a raise in the value given to scientific abilities and their assessment.
- All attendees actively took part in the creative activities. This strengthened our community of Physics teachers and students interested in Physics Education.
- The responses to the questionnaire revealed willingness to question traditional methods and embrace new habits.
- The proposed innovative tools have been appreciated and meet the needs of the teachers who participated.

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We send a thought to Alan Van Heuvelen, who dedicated his life to Physics Education research and has had an enormous impact on ISLE's growth.

References:
[1] L. Gandini et al. In the Spirit of the Studio: Learning from the Atelier of Reggio Emilia (Early Childhood Education Series). Teachers College Press, 2005.
[2] E. Etkina, B. Gregorcic e S. Vokos. «Organizing physics teacher professional educa- tion around productive habit development: A way to meet reform challenges». Phy. Rev. Physics education research 2017. 13, 010107.
[3] A. Sarlah e G. Planinšič. «Designing new types of problems using peer-reviewed papers». Eur. J. Physics 2023. 44 055702.
[4] E. Etkina et al. «Scientific abilities and their assessment». Phy. Rev. Physics education research 2006. 2(2), 020103. APS.
[5] E. Etkina et al. College Physics: Explore and Apply. Second edition. Pearson, 2019.

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