

AN AUTHENTIC LEARNING
& GENDER INCLUSIVE
FRAMEWORK FOR TEACHING
INFORMATICS IN SCHOOLS
ACROSS EUROPE



Enhancing Informatics Education in Cyprus: Detailed Insights from the TINKER Project

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Background and Rationale

Digital Transition in the EU

The EU and Member States aim to achieve specific digital targets **by 2030**, focusing on equipping **80% of people with basic digital skills** and **increasing ICT specialists to 20 million**, with gender convergence.

Current Digital Skills Scenario

- **Only 54%** of Europeans possess **basic digital skills** (DESI, 2022).
- Informatics education is pivotal for future **industrial and economic** progress.
- **Fragmentation and lack of uniformity** in informatics education across EU schools.

Challenges in Informatics Education

1. Insufficient Knowledge Base
2. Gender Imbalance

Identified Needs

Curricula Reform and Teacher Training

Existing professional development largely focuses on curriculum delivery, neglecting crucial pedagogical aspects.

Address ICT Skills Gap

only 42% of young high school graduates in EU possess above-basic digital skills

Gender Equality in Informatics

persistent gender imbalances in informatics education and employment demand



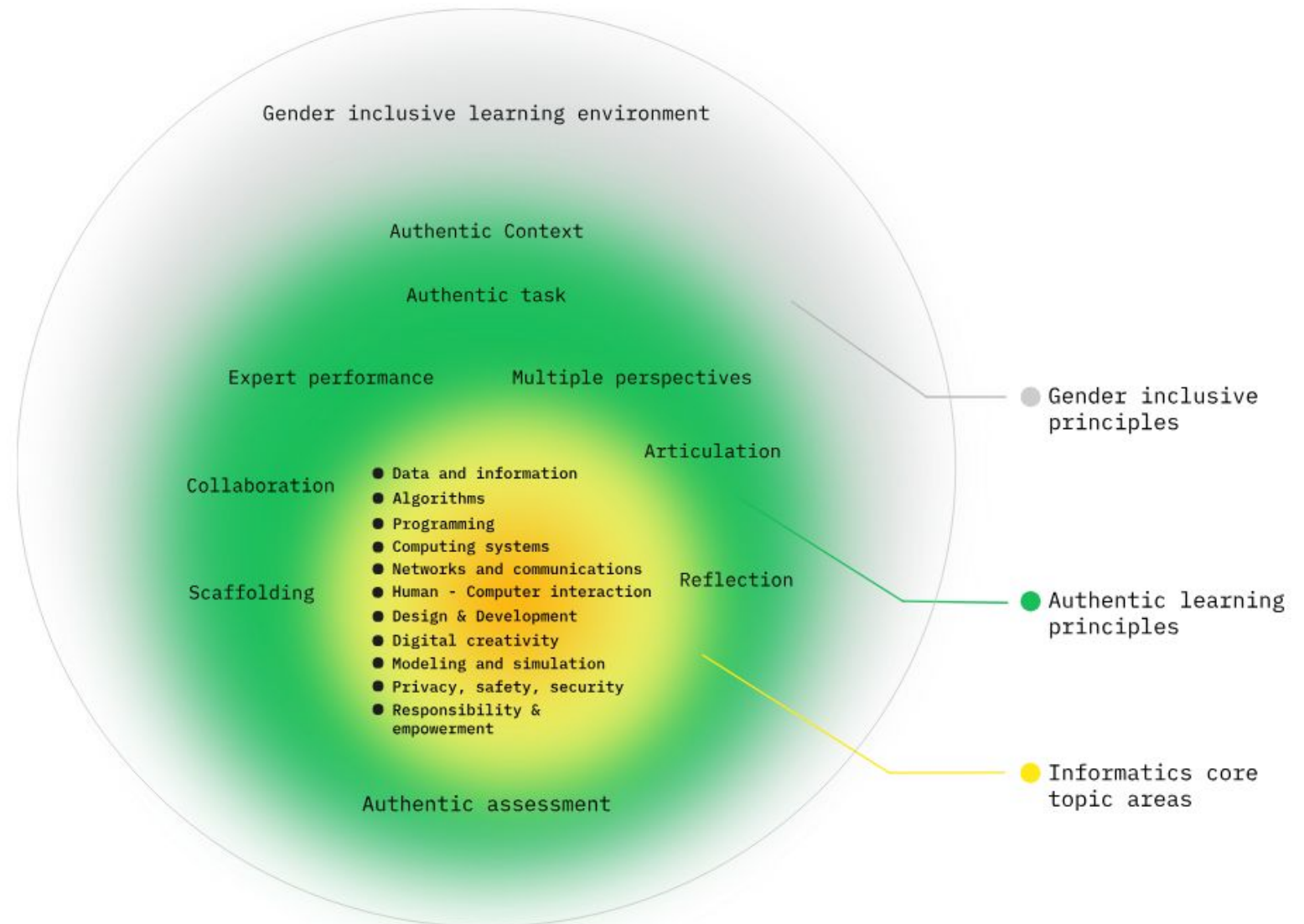
**Revolutionalising informatics education to
promote authentic learning and gender
inclusion in the field.**

<https://tinker-project.eu/>

TINKER Conceptual Framework

TINKER adopts a comprehensive approach based on the following core pillars:

1. Informatics Areas & Competencies
2. Authentic Learning
3. Gender-Inclusive Practices



Key concepts explained

Informatics Education	Authentic Learning	Gender Inclusion
<p>Informatics Education teaches the principles behind the digital world, focusing on how to model and manipulate real and digital objects. It aims to develop students' digital literacy, problem-solving skills, and critical thinking. This education prepares students to understand and engage with digital systems, addressing both their potential and challenges (Caspersen et al., 2022).</p>	<p>Authentic learning is modern a pedagogical approach where students actively work to solve real-world problems using broad knowledge and skills to create solutions (Herrington & Herrington, 2006). It involves complex, real-life tasks, collaboration, expert performance, reflection, and integrating assessment with the learning process (Herrington & Oliver, 2000; Herrington et al., 2014).</p>	<p>Gender-inclusive practices in education address biases and stereotypes, promote gender diversity awareness, and create inclusive learning experiences, incorporating critical theory, feminist pedagogy, and intersectionality. In STEM and computing, these practices involve assessing gender bias, featuring diverse role models, using relevant examples, fostering self-confidence, and employing inclusive language and activities to create an equitable learning environment for all students (Van der Vleuten et al., 2016; Christou et al., 2022; Happe et al., 2021).</p>

Informatics Education in Cyprus: Purpose of the Research

01

To provide an **overview** of the state-of-the-art **regarding informatics teaching in upper primary and lower secondary education in Cyprus**

02

To collect data on **teaching and assessing informatics** through **authentic learning** and **gender-inclusive practices** and **understand the needs and challenges** of teaching informatics **in relation to authentic learning and gender inclusion.**

Methodology

- Studied national curricula for upper primary (ages 10-12) and lower secondary (ages 12-14) education.
- Reviewed teacher and student books, activities, and guidelines.
- Examined reports, publications, and research papers on informatics education in Cyprus.
- Used official government websites and research databases like Google Scholar and SCOPUS.

DESK

RESEARCH

Research Questions

RQ1: What are the general aims and objectives, core topic areas, competencies, and specific learning outcomes defined in the national curricula for the field of informatics?

RQ2: Which teaching and assessment methods are followed to teach informatics competencies in upper primary and lower secondary education, according to the national curricula?

RQ3: As per the national curricula, which principles of authentic learning are applied, if applied, when teaching informatics, either as a separate subject or within other subjects?

RQ4: As per the national curricula, how is gender inclusion promoted, if promoted, when teaching informatics, either as a separate subject or within other subjects?

Current state of informatics education in Cyprus

Informatics as a subject	Topic Areas	Learning Outcomes
<p>Integrated into design and technology, mathematics, and physical sciences courses in primary education.</p> <p>Taught separately in lower secondary and upper secondary education (with elective options).</p>	<p>Basic concepts of informatics, computer hardware, operating systems, application software, networks and the Internet, cyberbullying, databases and systems analysis, algorithms, programming, and modern computer applications. Focus on specific applications like computer publishing, website development, and database management.</p>	<p>*Upper primary: Effective information search, basic programming, data use, responsible digital citizenship, cultivation of students' digital competence, technological literacy.</p> <p>* Lower Secondary: Develop problem-solving skills using computers, understand algorithms and computer programs, cultivate critical and creative thinking.</p>

Authentic learning practices

	Authentic Context	Authentic Task	Expert performance	Multiple role perspectives	Collaboration	Articulation	Reflection	Scaffolding	Authentic Assessment
Primary Education	✓	✓	x	✓	✓	✓	✓	✓	✓
Secondary Education	✓	✓	x	✓	✓	✓	✓	✓	✓

Curriculum Review of key courses:

Primary Education: "Design & Technology," "Mathematics," "Life Education" and "Physical Sciences"

Secondary Education: "Informatics" and "Design and Technology"

Gender-inclusive practices

	The materials, content, and activities incorporate gender diversity by featuring diverse figures in discussions and representations (e.g., frequency of female VS male representation).	The materials, content and activities encourage all individuals' empowerment	The materials, content and activities provide role models for all individuals	There isn't gender bias or stereotyping in language, in materials, content and activities	No gender bias or stereotyping in character representation in text and images across materials, content, and activities.	The materials, content and activities promote positive values relating to the acceptance of gender diversity.	The materials, content and activities support intersectionality (i.e., diverse perspectives, histories, and experiences are heard).
Primary Education	✓	x	x	✓	x	x	x
Secondary Education	✓	x	x	✓	✓	x	x

Curriculum Review of key courses:

Primary Education: "Design & Technology," "Mathematics," "Life Education" and "Physical Sciences"

Secondary Education: "Informatics" and "Design and Technology"

Focus Group:

- To **gather insights** on teaching informatics with authentic and gender-inclusive practices.
- 1 hour session online via Google Meet.
- **16 teachers** from public primary and secondary schools.

Online Questionnaire:

- To **understand current needs and challenges** in teaching and assessing informatics.
- Distributed in Greek.
- **68 responses**

FIELD RESEARCH

Insights from the Focus Group Analysis

Challenges in teaching informatics

A major concern was the **lack of a unified, comprehensive curriculum**, leading to inconsistent implementation across different schools.



This fragmentation creates disparities in student preparedness, leading to issues when they transition to secondary school.

Needs for Effective Informatics Instruction

There is an **urgent need for a standardized informatics curriculum** that gradually introduces key concepts and skills from an early age.



This would ensure that all students have a solid foundation in fundamental informatics concepts and skills.

Authentic Learning Practices in Informatics

Incorporating authentic learning practices, like real-world problems and projects, **plays a crucial role in informatics education.**



This approach fosters student engagement, creativity, and problem-solving skills.

Gender Inclusivity Considerations

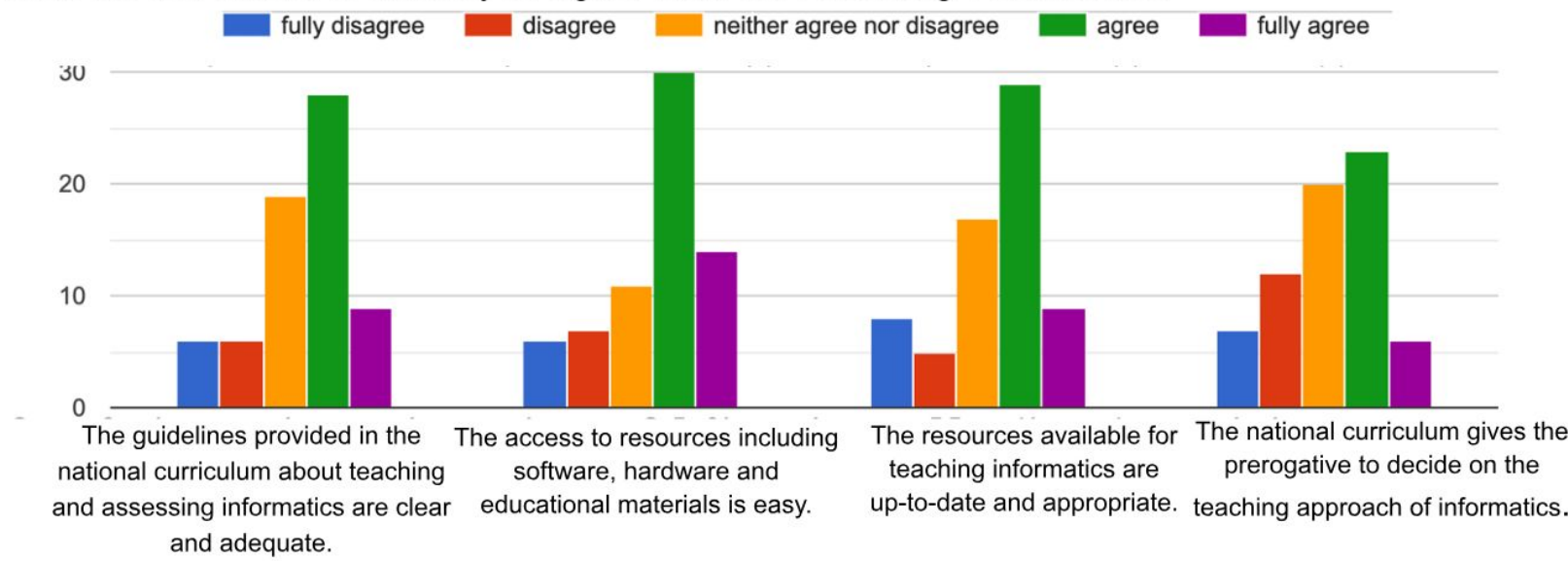
Addressing gender inclusivity in informatics education is essential, with a **clear need for more guidance and strategies.**



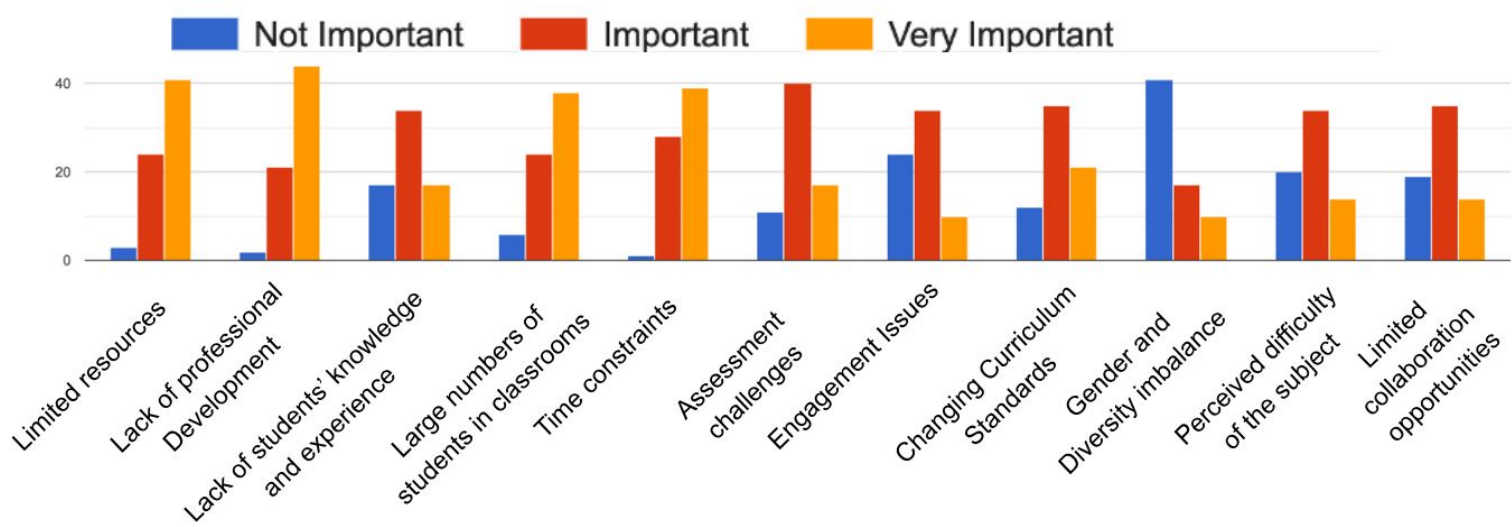
Teachers play a key role in fostering a balanced and supportive learning environment.

Insights from the Questionnaire Analysis: Informatics

Indicate the extent to which you agree with the following statements:



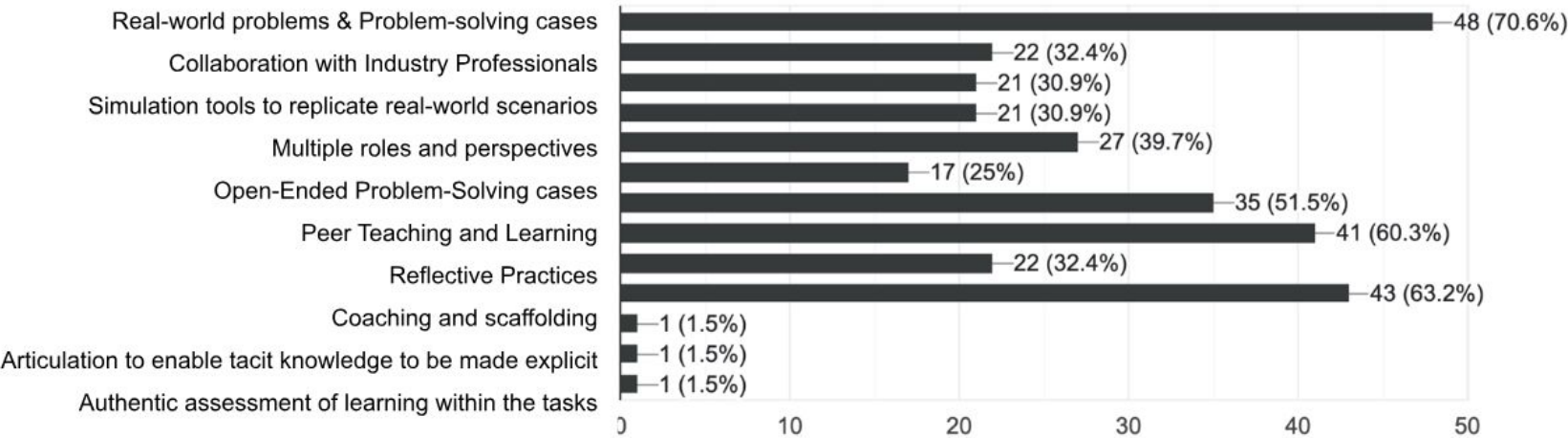
Indicate the importance of each of the obstacles/barriers below in teaching and assessing informatics:



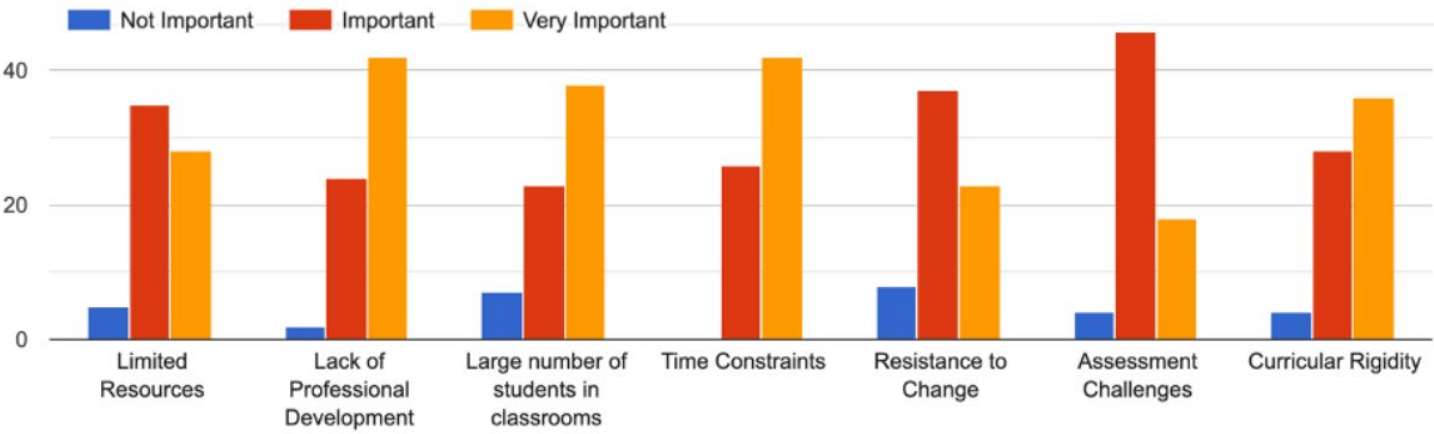
Insights from the Questionnaire Analysis: Authentic Learning

Which of the following authentic learning practices do you follow in your school when teaching and assessing informatics?

68 responses



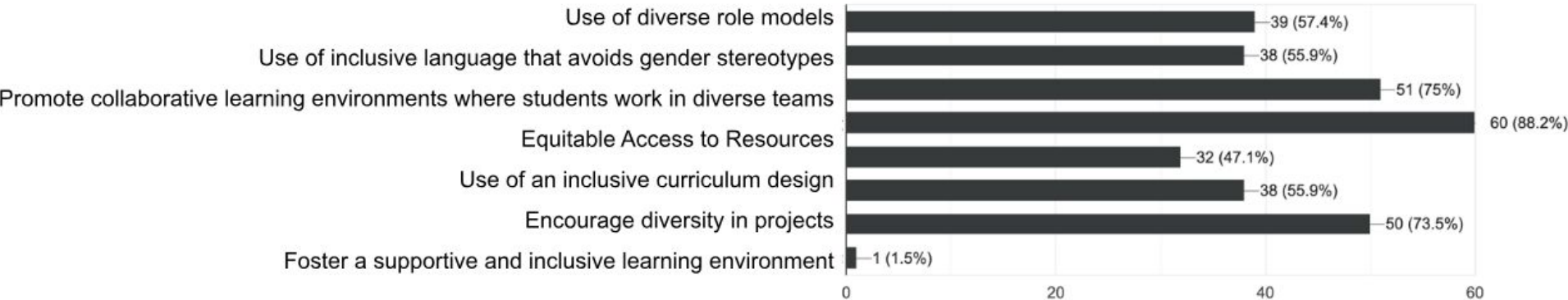
Indicate the importance of each of the obstacles/barriers in applying authentic learning when teaching informatics:



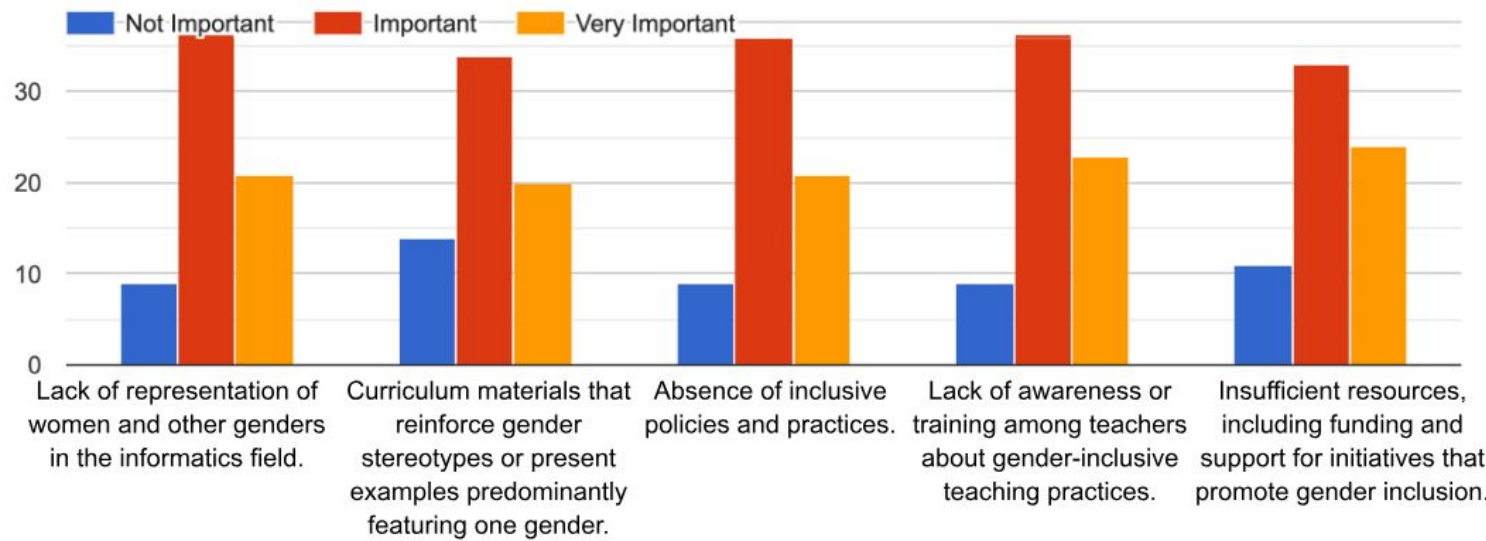
Insights from the Questionnaire Analysis: Gender Inclusion

Which of the following gender inclusive practices do you follow in your school when teaching informatics?

68 responses



Indicate the importance of each of the obstacles/barriers below in applying gender inclusion in informatics teaching:



Recommendations for Enhancing Informatics Education [I]

Curriculum Reform

- Make informatics a compulsory subject with a clear structure in primary education.
- Update the *Design and Technology* coursebooks to include gender-inclusive practices.
- Integrate digital skills across subjects, aligning with the European Digital Competence Framework, while considering gender inclusion and authentic learning.

Authentic Learning Practices

- Strengthen the use of real-world contexts and tasks in informatics education.
- Offer teachers resources and training on applying informatics to real-life situations
- Help educators fully understand authentic learning and how to apply it by offering focused professional development opportunities.

Recommendations for Enhancing Informatics Education [II]

Gender Inclusion

- Ensure curriculum content and teaching practices promote gender equity, using diverse examples and case studies.
- Provide guidelines to support gender-inclusive teaching practices.
- Expand inclusion efforts to represent different cultures, races, abilities, and socioeconomic backgrounds in learning materials and case studies.

Teacher Professional Learning

- Improve coordination and support for teacher training.
- Provide clear guidelines to help educators teach informatics effectively, offering professional development within school hours.

TINKER research across 6 EU countries



6 national
literature reviews



55 teachers in
focus groups



432 responses to
the online survey



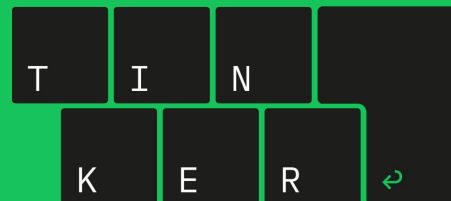
- **Common challenges in teaching informatics** include: inadequate teacher training, limited resources, time constraints, unstructured or fragmented curricula across different countries.
- **Challenges in using real-world examples in informatics lessons.**
- Obstacles, such as insufficient resources and biased curriculum materials, underscore the **complexity of fostering gender inclusion.**

(TINKER project, 2024)

Tinker Transnational Report available at: <https://tinker-project.eu/>

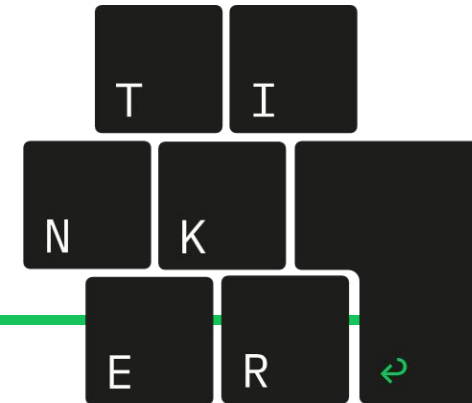
Next Steps:

An evidence based, authentic learning pedagogical framework in teaching informatics, in upper primary and lower secondary education through a contemporary gender-inclusive approach.



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Thank you for your attention.
Questions?

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