ELITe

Enhancing Learning In Teaching via e-inquiries

learning-in-teaching.eu

This project has been funded with support from the European Commission. This publication (communication) reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Co-funded by the Erasmus+ Programme of the European Union

WHAT IS ELITe?

ELITe is a 3-year project co-funded by the Erasmus+ programme of the European Commission.

The acronym stands for *Enhancing Learning In Teaching via e-inquiries*.

ELITe is concerned with supporting STEM teachers' **development of knowledge, skills and attitudes** so that they can effectively address their roles as **lifelong learners, facilitators of students' learning and members of educational communities**.

The project adopts the **inquiry-based learning** (IBL) **methodology** in professional learning activities as a means to facilitate STEM teachers' inquiry and reflective practice.

On one hand, ELITE aims to **outline the links** between **inquiry skills** practicing and STEM teachers' **competence development** and on the other hand, to inform **curriculum development** in STEM teachers' education.

THE PROJECT'S BACKGROUND

Perspectives		Challenges	Implicit requirements
	Contextual	Variation in terms of teacher competence requirements among and within EU countries	Place-based approach, taking into consideration national policy requirements and practice needs
	Methodological	Teachers' practice is influenced by the way they have received training themselves	Modernisation of teacher training methodology
	Content-related	Thematic that facilitates addressing STEM broader aims	Relevance of the thematic to STEM broader educational aims
	Outcome-related	Need for more rigorous evidence of the impact of competence based frameworks on teachers' professional learning	Need for evidence-based framework for STEM teachers' competence development

MAIN ELEMENTS OF THE APPROACH

- Adopts a **place-based approach** for STEM teachers' professional learning, taking into consideration **national policy requirements** and **practice needs**;
- Fosters the adoption of the **inquiry-based learning** (IBL) **methodology** in professional learning activities, under the assumption that STEM teachers' training via IBL methodology supports the **development of teacher competences**;
- As thematic for STEM teachers' professional learning, it promotes **content areas** that reflect current **policy orientation** on the broader aims of STEM education, so as to facilitate teachers to shape key competences required (knowledge, skills and attitudes) in order to help **students** in acquiring them;
- Is oriented towards **facilitating the development** of an evidence-based framework for teacher's competence development through IBL methodology.

COMPARATIVE OVERVIEW

The table below outlines the STEM teachers' competences required in **Greece**, **The Netherlands**, **Bulgaria**, and **Spain**.

Three facets of competences are taken into account:

» Knowledge and understanding;

» Skills;

» Dispositions and attitudes.

Each national framework takes into consideration on one hand **national policy documents** and teachers' competences groundwork (explicit aspects), whereas on the other hand, what derives from STEM students' curricula (implicit aspects).

Knowledge and understanding								
	Greece		The Netherlands		Bulgaria		Spain	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
Subject matter knowledge		x	x		x		x	
Pedagogical knowledge		x	x		x			x
Curricular knowledge	x	x	x		x		x	
Educational science foundations	x		x		x		x	
Contextual, institutional, organisational aspects of edu. policies	x		x		x		x	
Issues of inclusion and diversity	x	x	x	x	x		x	x
Effective use of technologies in learning	x	x	x	x	x	x	x	x
Developmental psychology	x	x	x		x		x	x
Group processes and dynamics, learning theories, motivational issues	x	x	x	x	x		x	
Evaluation and assessment		x	x		x		x	

Skills								
	Greece		The Netherlands		Bulgaria		Spain	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
Planning, managing and coordinating teaching	x	x	x	x	x	x	X	
Using teaching materials and technologies	x	x	x	x	x	x	X	
Managing students and groups		x	x	x	x	x	X	
Monitoring and assessing teaching/ learning objectives and processes	x		x	x	x		X	
Collecting, analysing evidence and data for professional decisions		x	x	x	x			x
Developing and creating research knowledge to inform practices	x		x	x	x		x	x
Collaborating with colleagues, parents and social services			x		x			
Negotiation skills (social and political interactions with multiple educational stakeholders, actors and contexts)								
Reflective, metacognitive, interpersonal skills for learning individually and in professional communities	x			x	x		x	
Adapting to educational contexts				x	x		x	

Dispositions and attitudes								
	Greece		The Netherlands		Bulgaria		Spain	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
Epistemological awareness	x				x	x	x	
Teaching skills through content		x	x		x		x	
Transferable skills				x	x			
Dispositions to change, flexibility, ongoing learning and professional improvement, including study and research	x			x	x		x	
Commitment to promoting the learning of all students	x	x	x		x		x	
Dispositions to promote students democratic attitudes and practices as European citizens	x	x	x	x	x			x
Critical attitudes to one's own teaching	x		x	x	x		x	
Dispositions to team working , collaboration and networking	x		x	x	x			x
Sense of self-efficacy								

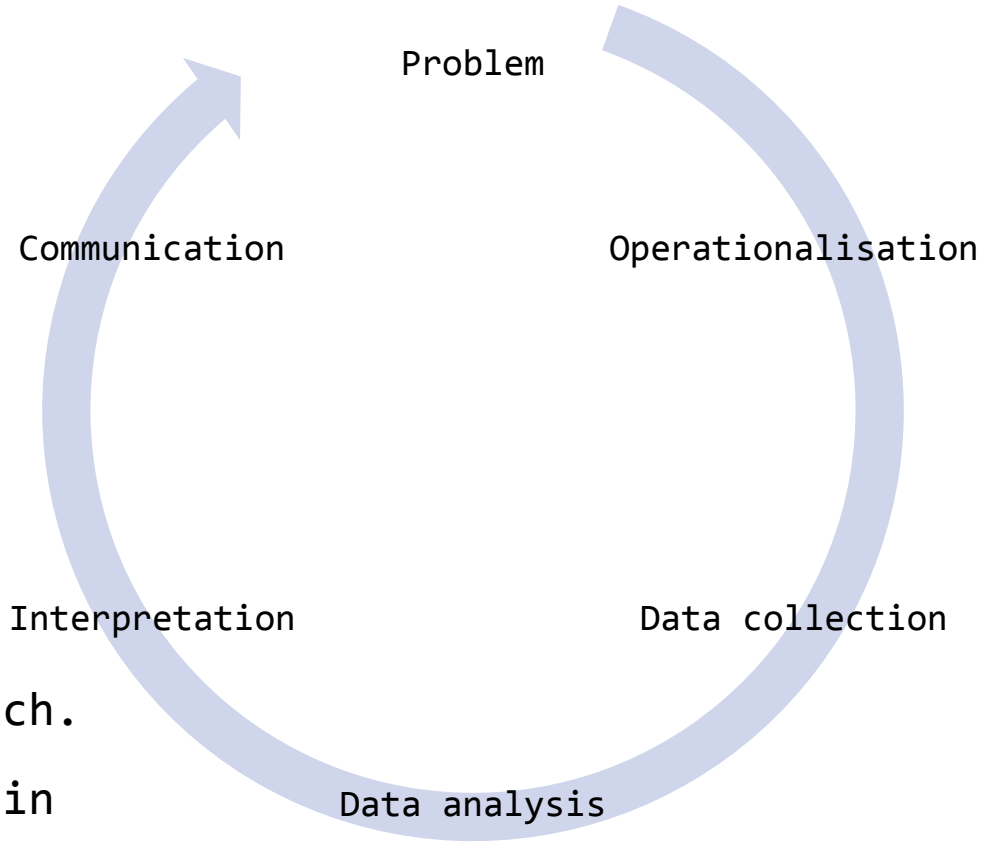
THE WESPOT IBL MODEL

The ELITe's approach for STEM teachers' professional learning foresees teachers training activities taking place through the **weSPOT** inquiry-based learning (IBL) model.

The weSPOT inquiry-based learning model has **six phases**. They resemble what researchers need to go through in order to carry out their research, since inquiry is an integral feature of science.

Each phase also consists of a number of **activities** ranging from **six** to **eleven**.

THE WESPOT IBL MODEL



The weSPOT model moves on from the simplistic **cyclical models steps** required for good research.

The steps are described in scientific literature (Crawford and Stucki, 1990; Hunt and Colander, 2010)

It models inquiry based learning process under 6 phases:

- Question
- Plan the method
- Data collection
- Data analysis
- Interpretation
- Communication

DIGITAL SCENARIOS

The scenarios for STEM teachers' professional learning correspond to **thematic areas** relating to **current challenges** for teaching and learning:

- Dealing with inclusion and diversity
- Teaching STEM for skill development
- Incorporating RRI in STEM education
- Innovative STEM methodologies (IBL and project work, self-directed learning, computational thinking)
- Opening up school science
- Assessment challenges in STEM
- ICT enhanced STEM learning and teaching
- Confronting challenges of new curricula
- Enhancing teachers-parents collaboration

The **thematic areas** by each country show common problems and gaps in STEM teachers' professional development in Greece, The Netherlands, Bulgaria, and Spain.

Thematic areas	Digital scenarios in...			
	Greece	The Netherlands	Bulgaria	Spain
Inclusion and diversity	Reflective practice for tackling inclusion and diversity issues in STEM classrooms		Neither sees nor hears, but succeeds /researchers with SEN in school/ Creating a learning design for successful learning through Inquiry based learning approach of pupils with SEN	Dealing with diversity in education: gender differences, learning styles, personalisation, etc.
Teaching STEM for skills development	Promoting students' achievement in STEM: Changing perspectives from knowledge acquisition to skills development	Learning to design Inquiry-based learning with DojoIBL: an exploration		Design of good IBL activities based on DojoIBL for teaching and learning
RRI in STEM education	Dealing with controversial socio-scientific issues in contemporary science			Strategies for introducing socio-scientific issues in the classroom: dilemmas, controversies, conversations

Thematic areas	Digital scenarios in...			
	Greece	**The Netherlands**	**Bulgaria**	**Spain**
Innovative STEM methodologies (IBL and project work, self-directed learning, computational thinking)	Design and delivery of an interdisciplinary STEM project	Self-directed learning for professionals in education. An online master-class for teacher, teacher educators and students of master of science in Educational Science interested in the topic of self-directed learning	*Detectives in the classroom* IBL approach in STEM discipline (how to design, deliver, conduct and evaluate IBL education in STEM)	Overcoming key difficulties of Inquiry Based Learning for STEM teachers
		Computational thinking in the (STEM) classroom and beyond		

Thematic areas	Digital scenarios in...			
	Greece	**The Netherlands**	**Bulgaria**	**Spain**
Opening up the STEM classroom	Opening-up science education: Taking advantage of the potential of informal science education	Learning and teaching in a seamless way (combining classroom learning with learning in the outside world: an introduction (part 1) and designing seamless learning experiences (part 2)	*Open air lessons – myth or not* Design of the open air field IBL education in STEM	Approaching STEM in collaboration with scientific centres, and science museums and other local institutions
Assessment challenges in STEM	Confronting challenges on IBL from implementation and assessment perspectives	Assessment of 21st century skills with technology: how do you do that in practice? Viewbrics, a tool for assessment	*Measure three times, cut once:* Assessment for success (methods, techniques and tools for assessment IBL project work and team work)	

Thematic areas	Digital scenarios in...			
	Greece	**The Netherlands**	**Bulgaria**	**Spain**
ICT enhanced STEM learning and teaching		Challenges of inquiry-based learning and how to tackle them using DojoIBL. A design-oriented course for teachers of STEM secondary vocational education	*Dream or Reality:* Combining 'dreams' (online tools, virtual reality, augmented reality and others) and 'reality' (real places for educational visits)	Emerging ICT technologies in STEM education: computational thinking, robotics, and game-based learning Open Science resources: use, adaptation and design of digital resources for the STEM classroom
Confronting challenges of new curricula			*The challenges in the new ICT curriculum for 8th grade* The scenario is dedicated to familiarise trainees with new challenges there and to prepare them for teaching under its framework	

Thematic areas	Digital scenarios in...			
	Greece	The Netherlands	Bulgaria	Spain
Enhancing teachers-parents collaboration	Overcoming personal bad experiences of parents for STEM success of their children			
	Supporting gender-neutral approaches to STEM at home			

The mapping of the **scenarios thematic areas** outlined common issues in teachers' professional development.

It became a ground for **collaborative discussions** about the **weak competences**, their origin and how they are presented in different countries.

The result is the development of teachers training **ELITe scenarios**, addressing the specific **audience**, **needs** and **framework** in each country.

THE ELITe HANDBOOK

The **handbook with guidelines** for STEM teachers' inquiry and reflective practice provides guidance for teacher educators and teachers upon the ELITe methodology. It includes:

- **information** about the **IBL approach** and reflective teacher training practices as well as their effectiveness when they are implemented together;
- a **tool** for evaluating competences and needs in initial teacher training;
- a set of **thematic areas** for teacher trainings, extracted by the study of national policies in four European countries: Greece, the Netherlands, Bulgaria and Spain;
- a **model** and corresponding **tools** for designing and implementing competence development teacher trainings, based on IBL and **reflective teachers' practices**;

Enhancing Learning In Teaching via e-inquiries
Project n. 2016-1-EL01-KA201-023647

THE ELITe HANDBOOK

- a set of basic **teacher training scenarios** in the provided thematic areas;
- examples of **different interpretations** and adjustment of the **basic scenarios** according to the national contexts and trainings conditions;
- **best practices** examples for teacher training implementation;
- a **free online tool** for designing and implementing an ELITe teacher competence development training.

It aims to facilitate development of **knowledge, skills** and **attitudes** of STEM teachers necessary to tackle requirements/ challenges for STEM practice under their roles as **learners, facilitators of students learning** and **members of educational communities.**

IMPLICATIONS (for policy)

Identification of **critical factors** that affect STEM teachers' learning for competence development, and **recommendations** for improving **national policies** for STEM teachers competence development.

IMPLICATIONS (for research)

Comparative insights on the dimensions and aspects of **competences** (knowledge and understanding, skills, dispositions and attitudes) that are **explicitly** and **implicitly** evident at policy, policy mediation and teaching practice levels in each country.

Context-based **outcome indicators** and **sub-indicators** for evaluating the impact of initiatives for STEM teachers competence development

IMPLICATIONS (for teachers)

Provision of STEM teachers' learning activities for competence development through **IBL**

learning-in-teaching.eu

An **evidence-based framework** for teachers competence development under IBL approach, and recommendations to teacher training **curriculum stakeholders.**