University of Maribor

FRAMEWORK PROGRAMME OF EARLY STAGE RESEARCHER TRAINING[1]

1. BASIC DATA

Mentor's name and surname	**prof. dr. Mateja PLOJ VIRTIČ**	Mentor's register number at ARIS (SICRIS):	**21444**
Mentor's e-mail:	mateja.plojvirtic@um.si	Mentor's tel. no.:	041 349 544
Research programme (RP) leader's name and surname:	prof. dr. Matjaž PERC	RP leader's register number at ARIS (SICRIS):	23428
Title of research programme:	Computationally intensive complex systems	RP's Register number at ARIS (SICRIS):	P1-0403
Research organisation (RO) of University of Maribor, where training shall be conducted:	UM FNM	RO Register number at ARIS (SICRIS):	0552-2547
Research field according to ARIS classification:	5.01.03 Education -> Subject-Specific Didactics	Research field according to EURAXESS classification	14. Educational Science

2. DEFINITION OF RESEARCH PROBLEM AND GOALS OF DOCTORAL RESEARCH[2]

Starting point of research task of the early stage researcher and its position in the research programme, where the mentor is included, work hypothesis, research goals and foreseen result with emphasis on an original contribution to science:

Energy literacy represents a key civilizational competence of modern society, enabling adolescents to transition from passive consumers to informed and critical co-creators of a sustainable future. It empowers them to understand and manage the complex interdependencies between technological development, environmental sustainability, and social responsibility.
In the educational process, we encounter heterogeneous student populations where the development of energy literacy is influenced by numerous interdependent variables, ranging from cognitive constraints to specific pedagogical interventions. The central research problem addresses how didactic transformation—the transition from static to dynamic, interactive learning models—affects the stability and depth of

[1] *Term early stage researcher (ESR) is written in male form and used as neutral for women and men.*

[2] *Research and study programme of training have to harmonise with contents of the research programme, where the mentor is a member.*

developed energy literacy. Using quantitative social research methods and complex data processing, this study will identify key factors for successful learning that foster the development of critical competencies within the Slovenian educational context.

Placement within the Research Program

The research treats the educational process as a non-linear system, where learning outcomes (energy literacy) are influenced by a convergence of heterogeneous factors (prior knowledge, cognitive constraints, digital competencies, socio-economic status). The application of computationally intensive methods, such as Structural Equation Modeling (SEM), enables the identification of complex interdependencies among these factors that traditional linear regression models fail to detect.

Working Hypothesis

"The implementation of dynamic and interactive learning modules in science and technology education significantly alters the structure and strength of correlations between the cognitive and affective components of energy literacy, thereby enabling more effective attainment of systemic understanding among students with diverse educational constraints."

Research Objectives

- To develop a set of interactive learning modules designed to enhance energy literacy among students.
- To analyze the impact of these modules on the development of critical thinking regarding complex environmental systems.
- To validate a comprehensive structural model of energy literacy, serving as a foundation for further adaptation of educational policies in modern society.

Expected Results and Original Contribution to Science

- The development and psychometric validation of a multidimensional instrument for measuring energy literacy.
- A comprehensive quantitative analysis that employs advanced statistics to explain how specific interactive elements contribute to narrowing the knowledge gap within heterogeneous student groups.
- Empirically supported didactic recommendations based on the modeling of real-world student responses within the school system.

3. STUDY PROGRAMME

Foreseen study programme, to which early stage researcher shall be enrolled in academic year 2026/2027:

Education in Engineering, 3rd Degree

4. DESCRIPTION OF WORK AND TASKS

- Conducting a comprehensive literature review in the fields of energy literacy, complex educational systems, and contemporary didactic approaches in STEM education.
- Designing and developing innovative, dynamic learning modules that incorporate active learning methods (simulations, digital tools, project-based learning) for teaching complex energy concepts.
- Developing and psychometrically validating a complex questionnaire for measuring multidimensional energy literacy.

- Implementing the developed learning modules in a real-world school environment (collaboration with selected primary schools) and monitoring the learning process within heterogeneous student groups.
- Conducting surveys and testing on a representative sample of primary school students (grades 6–9) in accordance with research ethical standards.
- Utilizing Structural Equation Modeling (SEM), factor analysis, and potentially multilevel modeling to identify non-linear correlations within the collected data.
- Studying interactions between various constraints (e.g., cognitive abilities, digital literacy) and learning outcomes from a complex systems perspective.
- Integrating statistical findings with pedagogical theory and formulating guidelines for didactic transformation.
- Drafting and publishing original scientific papers in high-impact journals.
- Actively participating in national and international scientific conferences in the field of education.
- Fulfilling all examination requirements of the doctoral program at the University of Maribor and preparing the doctoral dissertation.
- Participating in joint research tasks, seminars, and knowledge transfer within the research group.
- Occasional involvement in conducting tutorials/lab work for courses related to the didactics of technology.

5. REQUESTED LEVEL OF EDUCATION

VII/2

6. REQUESTED FIELD OF EDUCATION

A Master's degree (or equivalent 2nd cycle degree) in Education (Science/Technology), Natural Sciences, Technical Sciences, or Psychology.

7. KLASIUS SRV

17002, 17003, 17099

8. KLASIUS P

0114 (Teacher training with subject specialization – Natural Sciences, Technology, Physics, Mathematics, Computer Science), 0111 (Education science), 0313 (Psychology).

9. REQUESTED KNOWLEDGE

Proficiency in quantitative research methodology and statistical methods.
Ability to use data processing software tools (e.g., Jamovi or SPSS).
Knowledge of contemporary pedagogical approaches and the primary education system in Slovenia.
Excellent written and oral communication skills in Slovenian, and the ability to draft scientific texts in English.

10. REQUESTED SPECIAL REQUIREMENTS

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11. REQUESTED LANGUAGES

English language

12. REQUESTED WORK EXPERIENCE

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13. FORESEEN POSTDOCTORAL TRAINING

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Mentor's signature:
Mateja Ploj Virtič

Digitalno podpisal Mateja Ploj Virtič
Datum: 2026.02.03 09:43:44 +01'00'

Research programme leader's signature:

Matjaž Perc
Izdajatelj: SIGEN-CA G2
Št. potrdila: 342201FC00000000572D14FF
Datum podpisa: 04.02.2026
Potek veljavnosti potrdila: 05.07.2030

Name and surname of Dean or authorised person[3]:
prof. dr. Iztok BANIČ, dekan

Signature of dean or authorised person:

IZTOK BANIČ
Izdajatelj: RekonoSign RSA Q
Datum: 05.02.2026 10:48

Place and date:

Kliknite ali tapnite tukaj, če želite vnesti besedilo.

Kliknite ali tapnite tukaj, če želite vnesti datum.

Stamp:

[3] The training program is signed by the dean of the member where the ESR's employment and training will take place.