13 TH CONFERENCE | 26TH-30TH AUGUST 2019

PALAZZO DEI CONGRESSI - BOLOGNA, ITALY

WELCOME TO THE ESERA 2019 BOLOGNA CONFERENCE

Dear Colleagues,

We are delighted to welcome you to the 2019 ESERA conference in Bologna, Italy, August 26-30, 2019.

It is a great honor for us to hold the most important conference on science education that we have in Europe. The first and last time that ESERA was organised in Italy was more than twenty years ago, in 1997, in Rome.

The theme we have chosen for this edition is "The beauty and pleasure of understanding: engaging with contemporary challenges through science education."

We chose this theme for several reasons. The first is that Bologna is considered one of the most beautiful universities in the world due to its historical buildings. We hope that the beauty of the surroundings will inspire our research and create a pleasant context for the discussions during the conference. The second reason is that we think that beauty can be engine of transformation, change and authentic engagement in an increasingly complex world.

Climate change, multiculturalism, the flourishing of new interdisciplinary disciplines (like cognitive neuroscience, artificial intelligence, digital humanities), and the problematic nature of socio-scientific issues in a digital and post-truth era are just a few examples of the contemporary challenges that we will discuss during the conference. As science educators, we believe that understanding is the preferred way to address these challenges, but we also think that they are so deep and novel that they necessitate collectively searching for new narratives, languages and forms of beauty.

For all these reasons, we hope the theme can be intellectually stimulating, contributing to the creation of an overarching layer of reflection and infusing our discussions with a visionary spirit, projected into the future.

Inspired by the conference theme, we have selected four plenary presentations and a panel. Following the custom of previous years, the additional parallel sessions will include symposia, oral presentations, interactive poster sessions and workshops, organised according to the eighteen strands that characterise the richness of the research in the ESERA community.

Together with the Scientific and the Local Organising Committee, we are looking forward to seeing you in Bologna. We are working to create the conditions for a thoughtful and inspirational scientific environment, enriched by social events that will allow you to discover the magical atmosphere of the historical centre of Bologna.

Enjoy the conference!

Olivia Levrini
ESERA 2019
Conference President

Giulia Tasquier
ESERA 2019
Conference Manager

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SELF-EFFICACY OF IN-SERVICE SECONDARY SCHOOL TEACHERS TOWARD EDUCATION FOR SUSTAINABLE DEVELOPMENT: PRELIMINARY FINDINGS

Education for Sustainable Development (ESD) is among the most urgent and promising challenges of the 21st century aiming to reorient modern societies towards sustainability. Although several frameworks have been proposed regarding knowledge, skills, and competencies that teachers should possess in order to teach environmental issues, the majority of these frameworks can hardly cover the wider agenda of sustainable development goals (SDGs) and important pedagogical elements of ESD, such as critical and systems thinking. Literature indicates a bulk of studies about secondary education teachers' ecological and environmental literacy, a very limited number of studies focusing on Environmental Education self-efficacy, and no study dealing with teachers' ESD self-efficacy. In this pilot study, we explore the self-efficacy of in-service secondary school teachers using the newly developed and published TSESESD instrument. In parallel to the self-efficacy scale, a perceived knowledge scale was also administered to them. Participants were 267 teachers from various specializations serving in public secondary schools. Preliminary findings revealed that teachers were found to possess rather moderate perceived knowledge, while they displayed slightly higher self-efficacy scores, considering themselves to be better prepared to teach about values and ethics, emotions and feelings, and in a lesser extent about actions and systems thinking. Science teachers, although demonstrated significantly higher perceived knowledge scores, they fell short in self-efficacy performance in comparison to their peers from humanities studies.

Keywords: Self-efficacy, Teacher professional development, Scientific competencies

INTRODUCTION

Education for Sustainable Development (ESD) has become one of the most promising and emerging priorities of our days (Wals, 2012). The environmental and sustainability issues, such as climate change, ecosystems degradation, food insecurity, and social inequalities have worsen during the last decades, threatening modern societies and natural ecosystems. In this context, the role of education and particularly educators is crucial as they have to provide their students with the appropriate sustainability concepts and competencies necessary for a turn to a more sustainable future (UNESCO, 2005; Rieckmann, 2018).

A number of international organizations have developed frameworks of knowledge, skills, and competencies that educators should possess in order to sufficiently address these challenges. Furthermore, several teacher preparation models and programmes have been organized aiming to develop in-service and pre-service teachers' competencies that meet ESD needs (Ferreira, Ryan & Tilbury, 2006). In this context, self-efficacy is among the most influential factors affecting teachers' ability to implement ESD (Moseley, Huss & Utley, 2010). Although several scales assessing either teachers' general self-efficacy or some of its specialized aspects have already been developed (see Tschannen-Moran & Woolfolk Hoy, 2001), the majority of them were science oriented and originated from the science teaching efficacy beliefs scale (STEBI-B) (Enochs & Riggs, 1990). However, the emergence of ESD necessitated the development of a new assessment instrument focusing on teachers. This new instrument, called Teachers' Self-Efficacy Scale for Education for Sustainable Development (TSESESD) has already been used with pre-service primary school teachers (Authors, 2018). Based on the above, the goal of the present study is to examine the psychometric properties of TSESESD with

in-service secondary school teachers and assess their self-efficacy for ESD, as well as their shelf-perceived knowledge.

METHOD

Two hundred sixty-seven in-service secondary education teachers from Greece (56% females), the majority of which had less than 20 years of service, participated in the present pilot study. 48.3% came from science disciplines, 64.3% was serving in junior high schools (grades 7-9) and 35.7% in upper high schools (grades 10-12). Their previous experience with ESD, either by attending relevant training seminars or implementing ESD projects at their schools, was limited (39.2% and 25.4%, respectively). For the purpose of this study TSESESD, which is comprised of 24 items and organized in four domains: (a) values and ethics, (b) systems thinking, (c) emotions and feelings, and (d) actions, was used (Authors, 2018). However, although knowledge is not a constituent part of self-efficacy, in parallel to TSESESD, a perceived knowledge scale was also used. Teachers' answers were assigned to numbers from 1 to 7; lower scale scores indicated lower teachers' self-efficacy and vice versa. All domains showed excellent internal consistency values, revealing an overall Cronbach a 0.975 for Self-efficacy, and 0.971 for Perceived knowledge, respectively (Table 1). Inter-correlations both within scale domains and between TSESESD and perceived Knowledge scale were also calculated (Table 2).

RESULTS

Greek in-service secondary school teachers were found to possess rather moderate perceived knowledge of specific environmental and sustainability issues (4.06±1.68), while they presented slightly higher scores in the TSESESD domains (4.43±1.47), indicating though also moderate self-efficacy (Table 1).

Table 1. In-service teachers' self-efficacy scale for ESD (TSESESD), perceived knowledge scale, and their sub-domains indices

Domain	Items	Range	Mean	sd	Cronbach α	Skewness	Kurtosis
Values and ethics	6	1 – 7	4.77	1.49	0.944	-0.508	-0.246
Systems thinking	5	1 – 7	4.15	1.54	0.936	-0.159	-0.614
Emotions and feelings	3	1 – 7	4.61	1.33	0.885	-0.417	-0.023
Actions	10	1 – 7	4.31	1.47	0.962	-0.314	-0.319
Total	**24**	**1 – 7**	**4.43**	**1.47**	**0.975**	**-0.343**	**-0.325**
Perceived Knowledge							
Content Knowledge (CK)	14	1 – 7	4.33	1.73	0.949	-0.156	-0.088
Pedagogical Content Knowledge (PCK)	17	1 – 7	3.84	1.65	0.966	-0.749	-0.720
Total	**31**	**1 – 7**	**4.06**	**1.68**	**0.971**	**-0.022**	**-0.733**

More specifically, for the Self-efficacy Scale, "Values and Ethics" with six items in total presented the highest mean score among the domains (4.77±1.49), while "Systems thinking" with five items showed the lowest one (4.15±1.54). In regard to the Perceived Knowledge Scale, content knowledge presented the highest mean score (4.33±1.73) (Table 1). All inter-correlations, which are considered as adequate in magnitude and statistically significant ($p \leq 0.01$), are shown in Table 2. Furthermore, while male teachers appeared to be slightly more knowledgeable, their female counterparts showed rather higher self-efficacy values. Seminar training and former experience in ESD positively influenced teachers' both perceived knowledge and self-efficacy ($p \leq 0.05$). Finally, in terms of teacher specialization, science teachers who, according to their statements seem

to receive environmental information mainly from the internet and specialized books, although revealed significantly higher scores in perceived CK and PCK ($p \leq 0.05$), they were slightly surpassed by their peers from humanities studies in self-efficacy domains.

Table 2. Correlation indices among the domains under study (** correlation is significant at the 0.01 level)

	1	1a	1b	1c	1d	2	2a	2b
1. TSESESD		0.887**	0.896**	0.840**	0.946**	0.775**	0.574**	0.833**
1a. TSESESD Values & Ethics			0.771**	0.686**	0.736**	0.732**	0.561**	0.772**
1b. TSESESD Systems thinking				0.678**	0.777**	0.758**	0.577**	0.803**
1c. TSESESD Emotions & Feelings					0.789**	0.559**	0.391**	0.620**
1d. TSESESD Actions						0.697**	0.503**	0.761**
2. Knowledge							0.909**	0.937**
2a. Content Knowledge								0.706**
2b. Pedagogical Content Knowledge								

DISCUSSION & CONCLUSIONS

Results indicate that TSESESD has good psychometric properties, accompanied by strong validity and reliability scores for secondary school teachers. Moreover, high correlation scores within scale domains were recorded revealing the relevance of the studied issues, while the strong correlation between TSESESD and perceived knowledge shows a strong relation between these two variables. These findings indicate that TSESESD can be used both in pre- and in-service secondary teachers' education contexts to reveal teachers' self-efficacy in ESD. Accordingly, teachers' preparation programmes may plan appropriate curricula and educational material to reinforce teachers' competences when needed as well as to support their educational practice.

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ESERA'19 EUROPEAN SCIENCE EDUCATION RESEARCH ASSOCIATION

CERTIFICATE OF ATTENDANCE

We hereby certify that

ATHANASIOS MOGMAS

has attended the

13th Conference of the

European Science Education Research Association (ESERA)

Bologna, 26 – 30 August 2019

Olivia Levrini

Olivia Levrini

ESERA 2019 Conference President