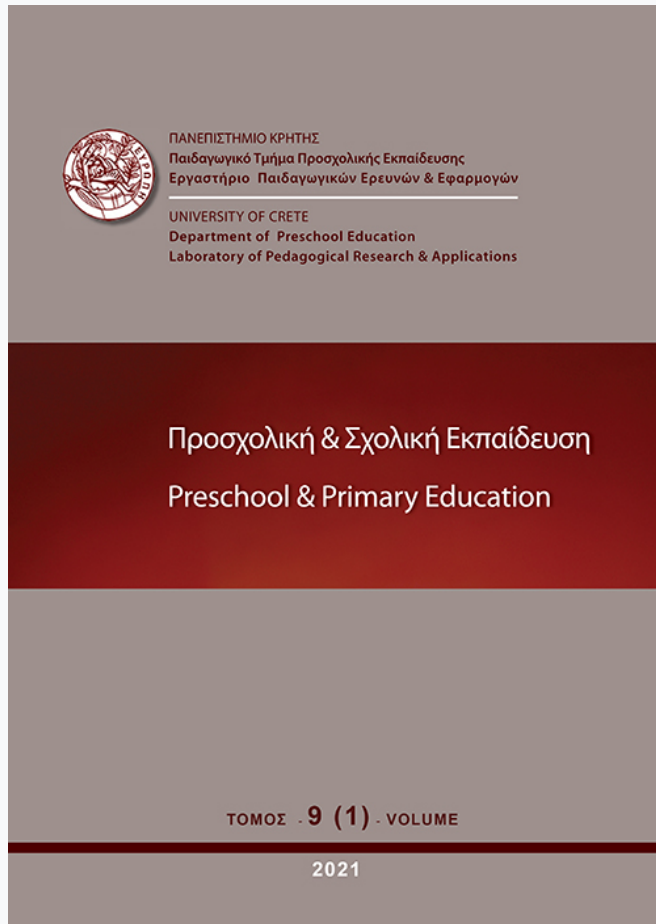


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# Secondary special education teachers' beliefs towards their teaching self-efficacy

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**Abstract.** The self-efficacy of special education teachers is a key aspect of the educational process for inclusive learning and co-teaching. However, research on self-efficacy perceptions in the area of special education and particularly in the field of parallel support is very limited. The aim of this research is to adapt a scale measuring the beliefs of special education teachers' self-efficacy in supporting students who need parallel support in secondary education and therefore to investigate those beliefs, as well as the factors that affect them. The study involved 147 special educators for supporting students in Greek junior high schools or high schools. The "Teachers' Sense of Efficacy Scale" (TSES) by Tschannen-Moran & Woolfolk-Hoy (2001) was adapted to study and investigate the research questions. The results demonstrate that special education teachers report high levels of teaching self-efficacy with male special education teachers being distinguished by significantly higher self-efficacy levels compared to females. Moreover, the results revealed a positive correlation between the experience of participants and their levels of self-efficacy, a small negative correlation between the number of supported students and their levels of self-efficacy regarding teaching strategies and a medium negative correlation between the number of supported students and their levels of self-efficacy regarding student management.

**Keywords:** self-efficacy, secondary education, special education, levels of teaching self-efficacy, sense of teaching effectiveness

## Introduction

School teachers' teaching ability is often evaluated. However, self-assessment of their teaching methods to enhance students' progress has proven to be more important than the evaluation of others (Mastrothanasis, 2018). In the literature, teachers' perceptions of their teaching ability are defined as self-efficacy or a sense of teaching effectiveness and concerns teachers' beliefs about their ability to organize and perform effective teaching interventions to achieve their teaching goals (Tschannen-Moran & Woolfolk Hoy, 2001).

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For more than two decades, teachers' beliefs on efficacy have been recognized as a vital issue in improving education, teacher education, teaching, and attitudes towards education without exclusion. The teaching obligations and self-assessment of the teacher's ability to organize and perform the required actions for the best result determine the teacher's sense of efficacy. This sense of self-efficacy leads to new goals, efforts, and perseverance for efficient work by the school teachers, increasing their classroom performance. Furthermore, it seems that self-efficacy beliefs are important and can contribute positively to students' learning ability and motivation (Guo, Piasa, Justice, & Kaderavek, 2010; Guo, Sawyer, Justice, & Kaderavek, 2013; Schwab, 2019; Szabo & Mokhtari, 2004).

School teachers with a strong sense of efficacy are open to new ideas and are more willing to experiment with innovative methods to better meet the individual educational needs of their students (Maloch et al., 2003; Schwab, 2019; Szabo & Mokhtari, 2004) and persevere when their students have difficulties (Allinder, 1994; Reichenberg & Löfgren, 2019). They are also confident about their teaching abilities, as well as about their ability to bring positive changes in their students' abilities through their teaching interventions (Klassen & Tze, 2014; Wyatt, 2018; Zee & Koomen, 2016). In general, teachers' self-efficacy beliefs have been linked to their behaviour in the classroom (Hoy & Spero, 2005; Muijs & Reynolds, 2002; Sinclair, 2008; Szabo & Mokhtari, 2004; Woolfolk & Hoy, 1990), the achievement of teaching goals (Garvis & Tekin, 2016; Schunk & Pajares, 2002), students' motivation (Kaldi & Xafakos, 2017; Pajares, 1996; Tschannen-Moran & Woolfolk Hoy, 2001), as well as the sense of students' effectiveness (Caprara, Barbaranelli, Steca, & Malone, 2006; Goddard, Hoy, & Woolfolk Hoy, 2000; Klassen, Tze, Betts, & Gordon, 2011; Pajares, 1997; Pajares & Schunk, 2001; Schunk, 1991).

Due to the recent social transformation of schools into inclusive ones, with more students than ever being included in the general classroom (Banks et al., 2005), there is a critical need for all teachers to be ready to deal with the peculiarities of students, their linguistic and cognitive differences or possible disabilities. The inclusion of students with special needs in the general educational environment and their adaptation to the curriculum with specific actions by the educational community are some of the emerging principles that guide the education of students with disabilities, while seeking to create educational models that meet students' needs (Kavale, 2005). These efforts reveal the importance of teachers' preparation concerning the revision of their teaching practices and study of fields that help students accept their differences. In addition, inclusion will enhance collaborative effort between general and special education teachers (Burke & Sutherland, 2004; Kavale & Forness, 2000). Special as well as general education teachers need to be aware of the potential of each learner with difficulties or special educational needs, to work together and to consider the diversity of their students as something normal that needs differentiated instruction and collaborative effort (Bowlin, Bell, Coleman, & Cihak, 2015; Emmons & Zager, 2018). In this context, self-efficacy beliefs are important for the educational process, as they affect teachers' attitudes towards inclusion and co-teaching methods (Emmons & Zager, 2018; Unianu, 2012).

### **Self-efficacy of special education teachers**

Tschannen-Moran and Woolfolk Hoy (2001) defined teacher self-efficacy as teachers' confidence in their ability to promote student learning. Their definition was important in exploring elements that affect the success of inclusive education and the integration of students with disabilities in the general curriculum.

In the field of special education and for the needs of our research, based on the studies of Chao, Forlin and Ho (2016), Gavish, Bar-On and Shein-Kahalon (2016), Savolainen,

Engelbrecht, Nel and Malinen (2012), and Sharma, Shaikat and Furlonger (2015) who deal with special education teachers, we define the efficacy of special educators as the extent to which teachers believe they have the ability to influence the performance of their students through specialized teaching strategies that they use to promote inclusion, learning and engagement in the learning process, as well as the management of their classroom. We consider the teacher's personal views and cognitive judgments about his ability to effectively cope with the achievement of teaching and the holistic development of students in need of special support. These beliefs are related to specific judgements and situational beliefs about the particular educational role of the teacher and teaching inclusion needs, and they also contribute to assessing the teacher's general ability as a professional, thus influencing his further motivational behaviour.

Teachers' attitudes and beliefs about efficacy are related to the success of the educational process of students with special needs who are educated in inclusive educational environments and participate in general educational programmes (Allinder, 1994; Hutzler, Meier, Reuker, & Zitomer, 2019; Sharma, Loreman, & Forlin, 2012). The self-efficacy beliefs of a special education teacher are directly related to the improvement of learning outcomes. As a result, they constitute an important factor for the educational context that optimizes teaching effectiveness to help students (Kuronja, Čagran, & Krajnc, 2019; Leggio & Terras, 2019; Levi, Einav, Raskind, Ziv, & Margalit, 2013; Miesera, DeVries, Jungjohann, & Gebhardt, 2019; Peebles & Mendaglio, 2014; Sharma & Sokal, 2016; Shoulders & Krei, 2016). Studies that have examined the conditions for enhancing teacher effectiveness and improving students' academic achievement have found strong correlations between teachers' self-efficacy and behaviour (Gerhardt & Brown, 2006; Kuronja et al., 2019; Miesera, et al., 2019; Peebles & Mendaglio, 2014). Researchers note that teachers' self-efficacy beliefs may be a determining factor in effective teaching practices for students with a variety of difficulties or disabilities (Hutzler et al., 2019; Miesera, et al., 2019; Ozcan & Uzunboylu, 2017; Pajares, 1997; Sharma & Sokal, 2016; Shoulders & Krei, 2016). From all the research that has been identified on the subject, it appears that higher levels of self-efficacy are associated with improved learning outcomes (Kuronja et al., 2019; Leggio & Terras, 2019; Levi et al., 2013; Miesera et al., 2019; Peebles & Mendaglio, 2014; Sharma & Sokal, 2016; Shoulders & Krei, 2016), and that the types of difficulties students face are related to teacher's self-efficacy beliefs (Hutzler et al., 2019). However, studying the self-efficacy belief levels of special education teachers has only recently begun to be studied in a systematic way to understand the correlation between teacher self-efficacy beliefs and inclusion.

The literature review shows that special education teachers are generally distinguished by high levels of self-efficacy beliefs (Antoniou, Geralexis, & Charitaki, 2017; Gavish et al., 2016; Sarris, Christopoulou, Zaragas, Zakopoulou, & Papadimitropoulou, 2020; Wang, Zan, Liu, Liu, & Sharma, 2012) or medium ones (Ozcan & Uzunboylu, 2017), which are usually in line with their attitudes towards the inclusion of all students (Desombre, Lamotte, & Jury, 2019). According to Lamture and Gathoo (2017), as well as Wang, Zan, Liu, Liu, and Sharma (2012), special education teachers feel they have higher self-efficacy beliefs than general education teachers in terms of supporting and integrating students with special needs in the educational process.

### **Assessing Teacher's self-efficacy in special education**

A review of the literature found that there are many instruments for measuring the levels of self-efficacy beliefs for general education teachers. According to Tsigilis, Grammatikopoulos and Koustelios (2007) some examples of such instruments are the Teacher Locus of Control (TLC) (Rose & Medway, 1981) and the Responsibility for Student

Achievement (Guskey, 1988), the Ashton vignettes (Ashton, Buhr, & Crocker, 1984), the Teacher Efficacy Scale (TES) (Gibson & Dembo, 1984) and the Teachers' Sense of Efficacy Scale (TSES) by Tschannen-Moran and Woolfolk-Hoy (2001). However, these instruments evaluate what Chen, Gully and Eden (2001) refer to as the general level of sense of didactic effectiveness. According to Mastrothanasis (2018), research should be focused on the evaluation of perceptions in teaching of specific cognitive fields, since the concept of self-efficacy concerns specific fields of action (Bandura, 1997). According to Zhang, Wang, Stegall, Losinski and Katsiyannis (2018), "the trends of developing task-specific efficacy scales in recent years suggest an increased understanding among researchers that teacher efficacy is context, subject, and task specific. Teacher efficacy is not a very stable measure across class periods, subjects, or groups of students" (p. 3). It is necessary to develop and evaluate in terms of psychometrics, instruments that specialize in measuring the levels of self-efficacy beliefs of teachers who exclusively support students with learning difficulties or disabilities. Utilizing scales involving a different research population entails several risks of errors and measurements (Furr, 2017).

One of the few such instruments is the Student Teachers' Efficacy in Teaching Students With Disabilities (STETSD) by Zhang and colleagues (2018) which consists of a four-factor structure containing subscales assessing efficacy for a) academic intervention for students with disabilities, b) behavioural and functional skill intervention, c) referral and identification, and d) professional ethics. Another is the Teaching Students with Disabilities Efficacy Scale by Dawson and Scott (2013) which consists of five subscales regarding a) Instruction, b) Teacher Professionalism, c) Teacher Support, d) Classroom or Behaviour Management, and e) Related Duties. Yet another is the Teacher Efficacy to teach in Inclusive Classrooms Scale (TEIP) by Sharma et al. (2012) consists of a three-factor structure containing subscales assessing efficacy in a) using inclusive instruction, b) in collaboration and c) in dealing with disruptive behaviours.

Finally, modified instruments to evaluate didactic self-efficacy of general teachers in the field of special education are presented. For instance, Coladarci and Breton (1997) modified the Teacher Efficacy Scale (TES) by Gibson and Dembo (1984) to use in the special education resource-room context. However, in Greece so far no scale has been identified with this goal.

## Factors Affecting Self-efficacy

In recent years, qualitative and quantitative studies have gathered a wealth of information on the self-efficacy beliefs of special education teachers as well as the factors that affect them. Numerous studies have reported that teachers' beliefs about students, learning, the curriculum, and teaching skills have influenced the way they bridge their practices according to the needs of individual students with disabilities or difficulties (Jordan, Kircaali-Iftar, & Diamond, 1993; Pajares, 1992; Richardson & Placier, 2001; Stanovich & Jordan, 2002). In addition to the students' achievements, researchers have focused on examining the beliefs of special educators and their correlation to their time in the classroom, burn-out and innovative practices (Desombre et al., 2019).

Factors such as job stress, reduced job satisfaction, and burn-out also appear to negatively affect the levels of self-efficacy beliefs (Barnes, Cipriano, McCallops, Cucuini-Harmon, & Rivers, 2018; Capri & Guler, 2018; Kiel, Heimlich, Markowetz, Braun, & Weiß, 2016; Nuri, Demirok, & Direktör, 2017; Reichenberg & Löfgren, 2019). Research on teachers' time in the classroom and burn-out has revealed that teachers' levels of self-efficacy beliefs are

significantly correlated with practices that help teachers deal with burn-out and reduce its levels. On the contrary, frequent training (Bannister-Tyrrell et al., 2018; Forlin, Sharma, & Loreman, 2014; Gao & Mager, 2011; Green, 2012; Özokcu, 2018; Reina, Healy, Roldán, Hemmelmayr, & Klavina, 2019; Schwab, Hellmich, & Görel, 2017; Sokal & Sharma, 2014; Tournaki & Samuels, 2016), as well as the existence of structured curricula seem to contribute positively (Ozcan & Uzunboylu, 2017).

Most of the research refers to the levels of self-efficacy of preservice special education teachers (Ahsan, Deppeler, & Sharma, 2013; Bannister-Tyrrell et al., 2018; Bowlin et al., 2015; Gao & Mager, 2011; Mintz, 2019; Sharma et al., 2015; Shillingford & Karlin, 2014; Specht et al., 2016; Straus & Bondie, 2015) for whom it seems that in order to achieve higher levels of self-efficacy beliefs, their training related to the field of special education and inclusion plays an important role (Ahsan et al., 2013; Bannister-Tyrrell et al., 2018; Gao & Mager, 2011; Mintz, 2019; Sharma et al., 2015; Shillingford & Karlin, 2014). Respectively, in studies concerning the population of current special education teachers (Forlin et al., 2014; Green, 2012; Reina et al., 2019; Ruble, Usher, & McGrew, 2011; Savolainen et al., 2012; Shippen et al., 2011; Sokal & Sharma, 2014), the contribution of training is important (Chao et al., 2016; Forlin et al., 2014; Monteiro, Kuok, Correia, Forlin, & Teixeira, 2019; Pearson & Tan, 2015; Reina et al., 2019; Sokal & Sharma, 2014; Wang et al., 2012; Woodcock, Hemmings, & Kay, 2012).

There are studies that refer to the gender differences of special education teachers, as far as self-efficacy is concerned, some studies indicating men have higher levels (Specht et al., 2016) and others that maintain women have higher levels (Özokcu, 2017; Shaukat, Vishnumolakala, & Al Bustami, 2019).

The factor of work experience gained in the field of special education is positively related to the self-efficacy beliefs of special education teachers. According to Leyser, Zeiger and Romi (2011), Özokcu (2017), Schwab et al. (2017) and Specht et al. (2016), work experience is an important factor in teachers' self-efficacy beliefs in special education. According to Bandura (1986), active experiences and previous personal achievements are a source of self-efficacy development.

## **Purpose of the study**

The main purpose of this research is to adapt an instrument to measure the levels of self-efficacy beliefs of Greek special education teachers supporting students who need parallel support in secondary education. In Greece so far, no scale has been identified with this goal. Moreover, another purpose of this research is to investigate those beliefs as well as the factors that affect them. It is important to investigate the beliefs of special educators as to the level of their self-efficacy because there appears to be a gap in the research with regard to teachers in secondary education. There also seems to be a gap in exploring new directions in understanding the relationship between self-efficacy and its association with inclusion and co-teaching which must be examined.

## **Research hypotheses**

To achieve the above objectives, the following research hypotheses are considered:

1. The adapted version of TSES can provide reliable and valid measurements of self-efficacy of secondary special education teachers.
2. Parallel support teachers in secondary education are distinguished by high levels of self-efficacy beliefs.

3. There are gender differences considering the levels of self-efficacy beliefs of special education teachers in secondary education.
4. Years of teaching experience of special education teachers in secondary education are related to the levels of self-efficacy beliefs.
5. The number of students supported by a special education teacher in secondary education is related to the teacher's levels of self-efficacy beliefs.

## Method

### *Participants*

The study involved 147 secondary school teachers who were hired as substitute teachers in the 2019-2020 school year, as special educators to support students in Greek junior high schools or high schools. More specifically, 86 (58.5%) of them served in both junior high school and high school at the same time, 37 (25.2%) exclusively in high school and 24 (16.3%) exclusively in junior high school. The teachers supported an average of  $2.41 \pm 1.02$  students (min = 1, max = 4). Of the teachers, 131 (89.1%) were full-time substitute teachers, 10 (6.8%) were part-time and hourly wage deputies, and 6 (4.1%) worked as private tutoring staff, with an average teaching service of  $2.58 \pm 1.86$  years. Of the 147 teachers, 46 (31.3%) were men while 101 (68.7%) of them were women, serving in various areas of Greek territory (see: Table 1).

**Table 1** Frequency (N) and percentages (%) of demographic or background characteristics and occupational status of the research participants

Demographic or background characteristics	Categories	N	%
Gender	Male	46	31.3
	Female	101	68.7
Work relationship	Full-time substitute teacher	131	89.1
	Part-time substitute teacher	8	5.4
	Hourly substitute teacher	2	1.4
	Private Parallel Support	6	4.1
Education level	Junior High School	24	16.3
	High School	37	25.2
	Both Junior High School & High School	86	58.5
Number of supported students	One	32	21.8
	Two	49	33.3
	Three	40	27.2
	Four	26	17.7

More specifically, 7 (4.8%) of them were serving in the educational region of Crete, 12 (8.2%) of them in the region of Central Greece, 11 (7.5%) in the region of Western Macedonia, 9 (6.1%) in the region of Central Macedonia, 11 (7.5%) in the region of Eastern Macedonia and Thrace, 37 (25.2%) in the region of Attica, 7 (4.8%) in the region of North Aegean, 9 (6.1%) in the South Aegean region and 12 (8.2%) in the region of Western Greece. Moreover, 12 (8.2%) of them were serving in the Ionian Islands region, 8 (5.4%) in the Peloponnese region, 7 (4.8%) in the Epirus region, and lastly, 5 (3.4%) in the Thessaly region.

Regarding the specialty of the participants, 31 (21.1%) were mathematicians, 86 (58.5%) philologists, 21 (14.3%) physicists, and 9 (6.1%) teachers of chemistry or biology. Of those, 19 (12.9%) did not have an additional qualification other than their basic degree, while 16 (10.9%) had a second degree, 67 (45.6%) had a specialization in special education, 41 (27.9%) had a master's degree and 4 (2.7%) had a doctoral degree.

### ***Design***

A quantitative approach was adopted to investigate the levels of self-efficacy beliefs. The selection of quantitative methodology was based on the convenience and ease of use that it offers the researcher to collect data from a large number of individuals in a short period of time, as well as the ability to compare, and quantify the concepts under study, and statistically analyse data to find general trends and relationships between variables (Cohen, Manion, & Morrison, 2017; Creswell & Creswell, 2017; Robson & McCartan, 2016).

In this case, the sample survey was the most appropriate type of quantitative research, since it examines opinions, attitudes, perceptions, and beliefs (Creswell & Creswell, 2017). A self-efficacy rating scale for teachers was used as a data collection instrument, which included twenty-four closed-ended questions and is described below.

Due to financial and time limitations, convenience sampling was chosen, in which opinions, attitudes, perceptions, and beliefs are easily examined (Cohen et al., 2017). Convenience sampling is a method of selecting people who are willing and available to participate in the research. In such a case, even though it is not certain that the sample perfectly represents the target group, it can provide important information for answering the research questions (Mertler, 2018).

An important criterion for selecting the specific data collection methodology was the fact that our main purpose is to describe the general beliefs of a large number of teachers in combination with the effort to save time for the data collection process and reduce the cost of research. Moreover, the fact that there are no available directories describing the population and distribution of teachers in the educational regions of Greece, the selection of probability sampling methodologies for generalizing the results, was not possible.

### ***Instrument***

The standardized scale "Teachers' Sense of Efficacy Scale" by Tschannen-Moran and Woolfolk-Hoy (2001) in the Greek population (Poulou, 2007; Tsigilis, Koustelios, & Grammatikopoulos, 2010) was used as an instrument for the study and the investigation of the research hypotheses. This scale is based on Bandura's (1997) theoretical framework and exhibits satisfactory psychometric properties (Stalikas, Triliva, & Roussi, 2012).

The scale was adapted to the needs of our research in the area of parallel support teachers in secondary education. The verbal adaptation was considered necessary as the original scale was built for a general population of teachers, in general, and not only for special education teachers. The modified instrument consists of 24 questions and three subscales of teachers' levels of self-efficacy beliefs at the level of: a) teaching strategies (items 1, 4, 7, 10, 13, 15, 18, 23), b) student management (items 2, 5, 8, 11, 14, 19, 20, 21) and c) student engagement (items 3, 6, 9, 12, 16, 17, 22, 24).

Participants indicate the degree to which they consider each of the sentences characterizes them using a six-point Likert-type scale where 1 indicates that the sentence *does not characterize them at all*, 2 indicates *very little*, 3 *slightly*, 4 *to a large extent*, 5 *to a great extent* and 6 *always*. Also, 7 was added if the respondent does not know or does not want to respond to this statement, even though no respondent chose that option (see: Appendix).

## Analysis

The collected data were transferred to linear tables per individual, using the SPSS 21 statistical package, and analysed quantitatively to assess the levels of special education teachers' levels of self-efficacy beliefs in secondary education, and to investigate the factors that affect those levels.

Confirmatory factor analysis (CFA) was performed using the AMOS 21.0 software for verbal adaptation and to assess the internal consistency and validity of the scale. The confirmatory factor analysis was applied to the data using the Maximum Likelihood method for estimating the confirmatory factor analysis parameters in the theoretical model. To check the degree of fit of the model derived from the data to the theoretical model by Tschannen-Moran and Woolfolk-Hoy (2001), the following good of fitness indicators were used (DeVellis, 2003): a) the chi-square relative to its degree of freedom ( $\chi^2/df$ ), b) the Goodness-of-Fit Index (GFI), c) the Comparative Fit Index (CFI), d) the Root Mean Square Error of Approximation (RMSEA), e) the Bentler-Bonett Index or Normed Fit Index (NFI), f) the Incremental Fit Index (IFI), g) the Tucker Lewis Index (TLI) and finally the h) Standardized Root Mean Square Residual Index (SRMR).

Cronbach's Alpha reliability test was performed to assess the ability of the instrument to provide measurements that are characterized by accuracy and stability. Cronbach's Alpha measures the reliability of the measurement scale in the sense of internal consistency reliability and is one of the most important indicators of the stability of conceptual questionnaire construction (Furr, 2017).

The parameters of central tendency and dispersion statistics were calculated, and the quartiles were reported to determine the levels of self-efficacy in low, medium, and high. Independent Sample t-test and Kendall's tau-b ( $\tau_b$ ) correlation coefficient were used to evaluate the differences and correlations between self-efficacy and independent variables, respectively. Suggested norms for  $\tau_b$  are that a strong association is for  $|\tau_b| \geq 0.3$ , a medium association is for  $|\tau_b| = 0.20-0.29$  and a weak association is for  $|\tau_b| < 0.19$  (Kendall, 1976). Moreover, the effect sizes of Independent Sample t-test using Hedges'  $g$  ( $g$ ) were calculated. Suggested norms for  $g$  are that a large effect is 0.8, a medium effect is 0.5 and a small effect is 0.2 (Hedges, 1981). Finally, multiple linear regression was used to predict the levels of self-efficacy beliefs with the independent variables. Statistical significance level ( $p$ ) was set at 5%.

## Results

### *Scale's psychometric characteristics*

As already mentioned, a modified version of the "Teachers' Sense of Efficacy Scale" scale (Poulou, 2007; Tsigilis et al., 2010) by Tschannen-Moran and Woolfolk-Hoy (2001), was used as an instrument for the needs of our research in the field of parallel support in secondary education. The verbal adaptation of the scale was considered necessary at the first stage of our study since the original scale concerned a different population with more general characteristics than the population of the present study. As a result, the original scale is based on a different sampling context. As Zhang et al. (2018) mention in their research, although there are many instruments for measuring the self-efficacy of general education teachers, it is necessary to develop and evaluate new ones to measure the self-efficacy of teachers that support students with learning difficulties or disabilities. Thus, the first step in adapting the scale is to assess the psychometric structure of the participants' responses, in order to assess whether it can yield reliable and valid results so that the research questions can be answered.

### *Confirmatory factor analysis*

Confirmatory factor analysis was performed to evaluate the factor structure of the theoretical model. Several indexes were selected to assess the three-dimensional model under consideration, based on the work of Tschannen-Moran and Woolfolk-Hoy (2001).

**Table 2** Confirmatory factor analysis results

Index	Criterion	Model
$\chi^2/df$	$< 3 \dot{\eta} 2$	1.67
GFI	$> 0.80$	0.82
RMSEA	$< 0.08$	0.07
CI 90% RMSEA	$< 0.08$	0.05-0.07
NFI	$> 0.90$	0.91
IFI	$> 0.95$	0.96
TLI (NNFI)	$> 0.90$	0.96
CFI	$> 0.95$	0.96
SRMR	$< 0.10$	0.06

The analysis revealed that the three-factor model was well-adapted to the data. In more detail, absolute fit values of  $\chi^2/df = 1.67 < 2$  ( $\chi^2 = 404.54$ ,  $df = 243$ ) (Byrne, 2016), of  $GFI = 0.82 > 0.80$  (Marsh, Balla, & Hau, 2013), of  $SRMR = 0.06 < 0.1$  (Cangur & Ercan, 2015) and of  $RMSEA = 0.07 < 0.08$  (0.05 - 0.07) (Byrne, 2016), were found. Based on Wang and Wang (2019) the  $CI\ 90\% RMSEA$  is asymmetric (p. 22) and it is unlikely for the point estimate to match the upper limit.

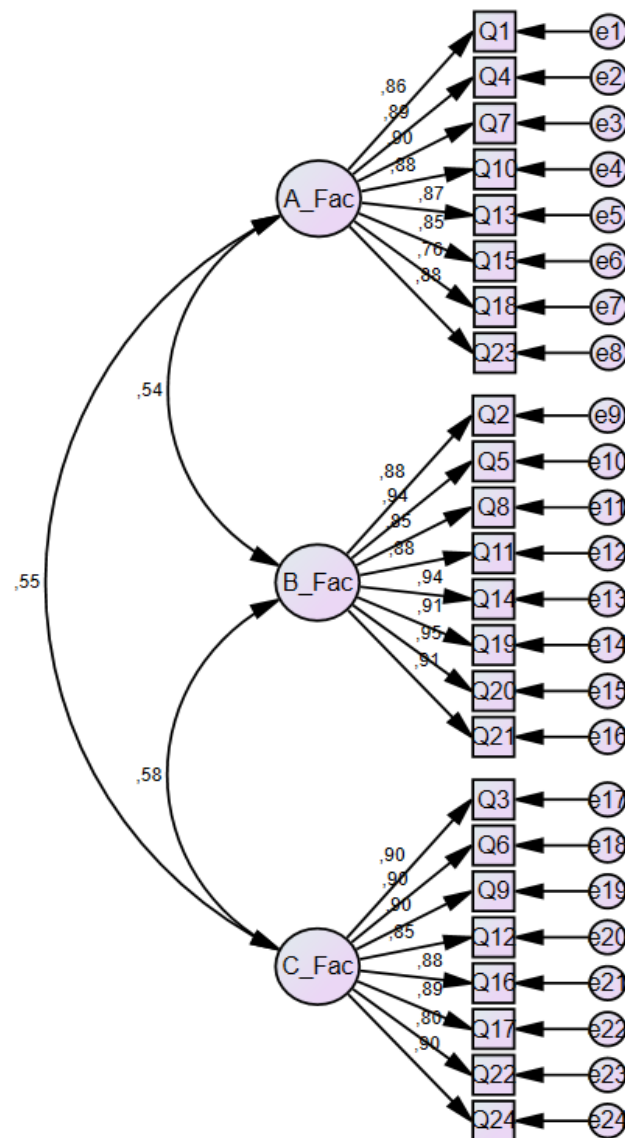
Considering incremental fit, values of  $NFI = 0.91 > 0.90$  (Hoyle, 2012; Schumacker & Lomax, 2016), of  $IFI = 0.96 > 0.95$  (Schumacker & Lomax, 2016), of  $TLI = 0.96 > 0.90$  (Browne & Cudeck, 1992) and of  $CFI = 0.96 > 0.95$  (Kline, 2016), were found.

The results described above, indicate that this model satisfactorily describes the data and should, therefore, be accepted. The standardized factor loadings for the three-factor model ranged from 0.76 to 0.95 and the factor correlation values between the factors ranged between 0.54 and 0.58.

### *Evaluation of scale reliability*

Regarding the internal consistency of the scale, the value of the Cronbach's alpha coefficient for the whole scale was at acceptable levels ( $\alpha = 0.96$ ). The coefficient  $\alpha$  for the individual factors was satisfactory ( $\alpha \geq 0.96$ ) (see: Table 3).

The analysis of the answers showed an average value of 97.27 and a standard deviation of 17.18 for all participants. Its range ( $R$ ) had a value of 92 and the interquartile deviation ( $Q$ ) had a value of 19.



**Figure 1** Standardized factor loadings of confirmatory factor analysis

**Table 3** Averages, standard deviations and internal consistency (Cronbach's Alpha) values for each factor and the scale

Factors	Number of questions	<i>M</i>	<i>SD</i>	<i>a</i>
Levels of teachers' self-efficacy beliefs regarding student management	8	3.99	0.83	0.97
Levels of teachers' self-efficacy beliefs regarding student engagement	8	3.57	0.90	0.96
Levels of teachers' self-efficacy beliefs regarding teaching strategies	8	4.59	0.89	0.96
Scale	24	4.05	0.72	0.96

### *Levels of self-efficacy*

To answer the research questions, it was deemed necessary to classify the levels of self-efficacy beliefs into low, medium, and high, which can be achieved methodologically using dividing quarters for the distinction to correspond to the data of the study (Mastrothanasis, 2018).

Table 5 lists the quartiles, as well as the frequency and percentage of the participants, as distributed by the quartile analysis in the scores of the scale.

**Table 5** Frequency (N) and percentage (%) of participants and quartile analysis for scale score

Quartiles	Cut-off score	N	%
25	36 - 90	38	25.85%
50	91 - 108	39	26.53%
75	109 - 128	70	47.62%

The results of the above analysis indicate that of the 147 teachers who took part in the survey, 38 (25.85%) showed low levels of self-efficacy beliefs, 39 (26.53%) of them showed medium levels of self-efficacy beliefs and 70 (47, 62%) of them showed high levels of self-efficacy beliefs, with the last category having the most individuals compared to the rest.

### *Investigating relationships between independent variables and self-efficacy scale*

A series of parametric or non-parametric tests were performed to investigate the relationships between the self-efficacy beliefs of special education teachers in secondary education and independent variables of gender, years of work experience in special education, and the number of students that the teacher supports in the current school year.

#### *Gender evaluation*

According to the results of the Independent Sample t-test, there is a statistically significant difference between gender and the scale factor that concerns teaching strategies self-efficacy beliefs  $t(103.24) = 3.47, p < 0.05, CI 95\% = 0.21 - 0.78$ . Particularly, male teachers show significantly higher self-efficacy levels regarding the teaching strategies factor ( $M = 4.93 \pm 0.75$ ) compared to female teachers ( $M = 4.44 \pm 0.90$ ).

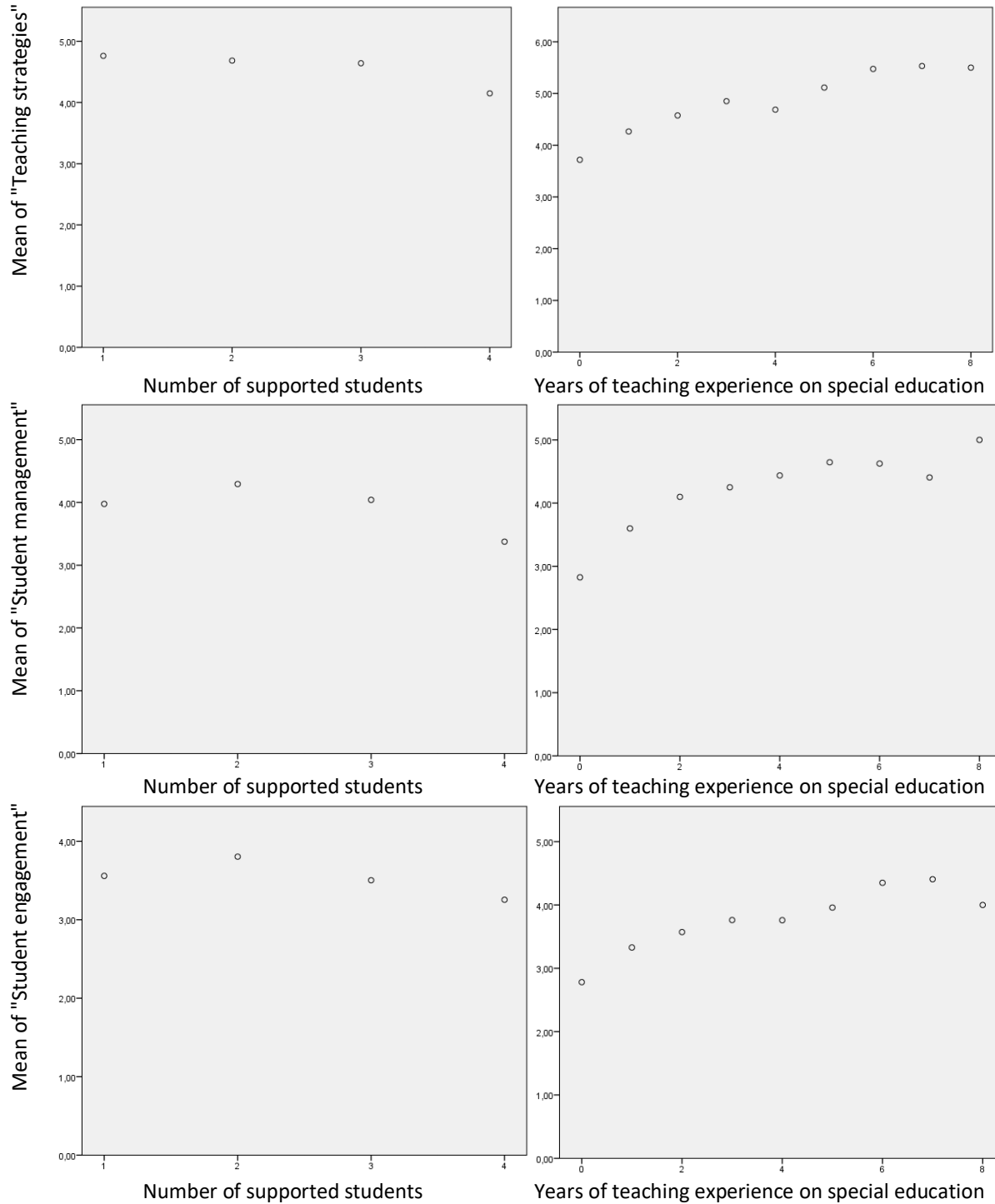
**Table 6** Assessment of teachers' self-efficacy between genders

	Male		Female		t	Df	p	g
	M	SD	M	SD				
Teaching strategies	4.93	0.75	4.44	0.90	3.47	103.24	0.001	0.57
Student management	4.26	0.64	3.87	0.88	2.71	145	0.008	0.48
Student engagement	3.81	0.69	3.46	0.91	2.63	111.85	0.01	0.41

There is also a statistically significant difference between genders regarding the scale factor that concerns student management  $t(145) = 2.71, p < 0.05, CI 95\% = 0.11 - 0.67$ . Particularly, male teachers show significantly higher self-efficacy levels in terms of student management ( $M = 4.26 \pm 0.64$ ) compared to female teachers ( $M = 3.87 \pm 0.88$ ) (see: Table 6). Finally, there is also a statistically significant difference between genders regarding the scale factor that concerns student engagement  $t(111.85) = 2.63, p < 0.05, CI 95\% = 0.09 - 0.63$ . Particularly, male teachers show significantly higher self-efficacy levels in terms of student engagement ( $M = 3.82 \pm 0.69$ ) compared to female teachers ( $M = 3.46 \pm 0.91$ ) (see: Table 6). The effect sizes are medium in all the cases mention above (Hedges, 1981).

### *Effect of self-efficacy beliefs from work experience on special education and the number of supported students*

Scatterplots were created (see: Figure 2) to examine the existence of linearity between the factors and the quantitative variables concerning work experience in special education and the number of supported students.



**Figure 2** Scatterplots between the mean of factors and the work experience status / number of supported students.

Examination of the scatterplots did not reveal clear linear relationships between the variables they present. As a result, the non-parametric Kendall's tau-b was selected as a method to investigate the intercorrelations between the quantitative variables under consideration.

According to the Kendall's tau-b correlation coefficient, a statistically significant correlation was found between the self-efficacy levels of special education teachers and the independent variables of "years of teaching experience" and that of "number of students supported by the teacher in the current year".

**Table 7** Intercorrelations between years of teaching experience, number of students supported by the special education teacher and the self-efficacy factors

Components	Number of students	Years of teaching experience
Teaching strategies	-0.19*	0.37*
Student management	-0.23*	0.50*
Student engagement	-0.12	0.30*

Note \*  $p < 0.001$  (2-tailed)

In particular, there was a large positive correlation between years of service and the factor concerning teaching strategies ( $\tau_b = 0.37, p < 0.001$ ), the student management factor ( $\tau_b = 0.50, p < 0.001$ ) and the student engagement factor ( $\tau_b = 0.30, p < .001$ ). There was also a small negative correlation between the number of students supported by the special education teacher in the current year and the factor concerning teaching strategies ( $\tau_b = -0.19, p < 0.001$ ) and a medium negative correlation between the number of students supported by the special education teacher in the current year and the factor concerning student management ( $\tau_b = -0.23, p < 0.001$ ).

### *Multiple linear regression*

Multiple linear regression was calculated to predict self-efficacy beliefs based on gender, the number of students supported by the teacher in the current year and the years of teaching experience. A significant regression equation was found ( $F(3, 143) = 37.96, p < 0.001$ ), with an  $R^2$  of 0.44. Participants' predicted self-efficacy beliefs is equal to  $85.37 + 5.29$  (years of teaching experience)  $- 1.95$  (number of students supported by the teacher in the current year)  $+ 9.41$  (gender) where years of teaching experience is coded in years, the number of students supported by the teacher in the current year is measured with the absolute value of the number of students and gender is coded as 0 = women and 1 = men. Participants' self-efficacy beliefs increased by 5.29 units for each year of teaching experience, decreased by 1.95 units for each additional student supported by the special education teacher and men's self-efficacy is higher by 9.41 units compared to women. Years of teaching experience ( $p < 0.001$ ) and gender ( $p < 0.001$ ) were significant predictors of self-efficacy beliefs, while the number of students supported by the teacher in the current year, was not ( $p = 0.08$ ).

### **Discussion**

The aim of this paper was to adapt an instrument for the reliable and valid measurement of the levels of self-efficacy beliefs of special education teachers in secondary education who support students in need of parallel support, as well as to investigate the beliefs and factors that affect them.

As the confirmatory factor analysis results revealed, the adaptation of the “Teachers' Sense of Efficacy Scale” (TSES) by Tschannen-Moran and Woolfolk-Hoy (2001) can provide reliable and valid measurements of parallel support teachers' levels of self-efficacy beliefs, in secondary education. This is important because, as Zhang et al. (2018) discuss in their research, even though there are various instruments for measuring the levels of self-efficacy beliefs of teachers in general, it is necessary to develop and psychometrically evaluate scales that can measure the levels of self-efficacy beliefs of teachers who exclusively support students with learning difficulties or disabilities. From the scale adaptation mentioned above, a reliable and valid scale has been formed which includes the factors of the Tschannen-Moran and Woolfolk-Hoy (2001) instrument that refer to the levels of self-efficacy beliefs considering student management, student engagement, and teaching strategies, in the field of parallel support, in secondary education. The first factor of the scale, that of teaching strategies, includes eight items about the ability of the special educator to utilize flexible teaching techniques to teach specific subjects in a comprehensible manner to the student. The second factor, that of student management, includes eight items about the ability of special education teachers to regulate the learning climate of their pupils, which is what Tschannen-Moran and Woolfolk-Hoy (2001) expressed as classroom management on the original scale. Student management refers to human resources management, that is the way the special education teacher manages his/her students in the classroom. Finally, the third factor, that of student engagement, also contains eight items and refers to the perception of the special educator's ability to keep the interest of his students active during the learning process.

Regarding the second research hypothesis, it was found that most of the parallel support teachers who took part in the research were distinguished by high levels of self-efficacy beliefs, regarding the factors of teaching strategies, student management, and student engagement. The finding is in line with the research of Sarris et al. (2020), of Gavish et al. (2016) and that of Wang et al. (2012), where it is mentioned that special education teachers who participated in their studies were distinguished by high levels of self-efficacy beliefs. However, the Ozcan and Uzunboylu study (2017) revealed only medium levels of self-efficacy beliefs. A possible explanation for the above finding may be the effect of the high expertise of Greek parallel support teachers on the levels of self-efficacy beliefs since, as revealed by the demographic presentation of teachers' characteristics, most of them are qualified with additional studies in special education. In fact, according to the relevant literature regarding the qualifications of special education teachers, there is a relationship between the variety of qualifications and the levels of self-efficacy beliefs of the special education teachers (Miesera & Gebhardt, 2018; Özokcu, 2018; Schwab et al., 2017; Shaukat et al., 2019; Song, 2016).

Regarding the third, fourth and fifth research hypotheses, a correlation between the independent variables of gender, teacher's years of work experience in special education, the number of students supported by the special education teacher and the levels of self-efficacy beliefs was found which is also supported in the bibliography (Leyser et al., 2011; Özokcu, 2017; Pearson & Tan, 2015; Sarris et al., 2020; Schwab et al., 2017; Shaukat et al., 2019; Specht et al., 2016). Moreover, it is also possible to predict the levels of self-efficacy beliefs using the independent variables.

Particularly, it was found that male teachers presented significantly higher self-efficacy beliefs regarding teaching strategies, student management, and student engagement than female teachers. The finding is in line with the research of Specht et al. (2016) who state that male special education teachers have higher levels of self-efficacy beliefs than females. On the other hand, the finding of our study contradicts the results of Özokcu (2017) and Shaukat et al., (2019) which found that women have higher self-efficacy beliefs than men. The

findings mentioned above probably stem from sociocultural reasons that are not specified. Future research is needed to specify these reasons.

Moreover, this study found a positive linear correlation between teachers' years of working experience in special education and levels of self-efficacy beliefs. The results showed that the most experienced teachers showed higher levels of self-efficacy beliefs regarding the factors of teaching strategies, student management, and student engagement compared to special education teachers with fewer years of teaching experience in the field of special education. The finding is in line with the research by Leyser et al., (2011), Özokcu (2017), Schwab et al., (2017) and Specht et al., (2016), where experience is mentioned as an important factor in the levels of self-efficacy beliefs in the field of special education. According to Bandura (1986), our previous experiences of success and failure as well as relevant vicarious experiences are a source of self-efficacy beliefs.

Finally, there was a small negative correlation between the number of students supported by the special education teacher in the current year and the factor concerning teaching strategies, as well as a medium negative correlation between the number of students supported by the special education teacher in the current year and the factor concerning student management. Although the research did not indicate that the number of supported students has a direct effect on the teacher's teaching self-efficacy, it appears that his / her student management and teaching strategies may be affected to some extent. Although no studies have been found to consider the number of students when examining levels of self-efficacy beliefs, the number of students may affect the teacher's self-efficacy regarding student management and teaching strategies due to factors such as burn out and other psychological individual factors associated with lower levels of self-efficacy beliefs in special education (Barnes et al., 2018; Christopoulou, Sarris, Zaragas, Zakopoulou, & Giannouli, 2020; Ruble et al., 2011; Sariçam & Sakiz, 2014; Wang et al., 2012). In the field of Greek education, due to the many students in need of parallel support, combined with the fact that the teacher is obliged to cover a specific teaching schedule, the teacher often moves from one school to another (often from 2 to 5 depending on his/her specialty), which negatively affects his/her psychology and increases his/her burn out levels.

## Conclusion

Special education self-efficacy refers to teacher beliefs about their ability to effectively perform the tasks needed to attain a valued goal. Based on our results, the special education teachers supporting students in need of parallel support in Greek junior high schools or high schools report high levels of teaching self-efficacy. Moreover, the study found differences between genders, and a relationship between the experience of participants in special education settings and their levels of self-efficacy. Finally, there is an inversely proportional relationship between the number of students supported by the special education teacher and self-efficacy perceptions.

Regarding the first research hypothesis, it was found that most of the parallel support teachers who took part in the research were distinguished by high levels of self-efficacy beliefs, regarding the factors of teaching strategies, student management, and student engagement.

Regarding the second, third and fourth research hypotheses, a correlation was found between the independent variables of gender, teacher's years of work experience in special education, the number of students supported by the special education teacher and the levels of self-efficacy beliefs.

Particularly, it was found that male teachers presented significantly higher self-efficacy beliefs regarding teaching strategies, student management, and student engagement than female teachers.

The most experienced teachers showed higher levels of self-efficacy beliefs regarding the factors of teaching strategies, student management, and student engagement compared to special education teachers with fewer years of teaching experience in the field of special education.

As a result, it became clear that the number of supported students does not have a direct effect on the teacher's teaching self-efficacy, even though it appears to affect his / her self-efficacy regarding student management and teaching strategies to some extent.

### Limitations and further research

One limitation of the present research was the sample used which emerged in an opportunistic way, limiting the possibilities of generalising the results. It is also worth investigating whether the findings of our study represent the population of special education teachers in secondary education, using qualitative research methods.

In no case can we assume that using only self-report questionnaires can provide evidence for a full understanding of the subject under investigation. It can, however, provide important information about the general trend of a particular group of participants, especially when used in a large number of participants and is combined with other research tools, such as interviews or observation, thus contributing to the triangulating of different data sources and extracting as much information as possible.

A subject of interest for future study is the investigation, formulation, and development of clusters based on the profile of special education teachers according to their self-efficacy beliefs. Approximation algorithms from the field of computational intelligence, can be used to form approximately similar groups of individuals, based on their common characteristics in the field of education (Chikh & Hank, 2016; Zervoudakis, Mastrothanasis, & Tsafarakis, 2020).

We hope that the results of the present study will be a subject of future research and that it will motivate researchers to further investigate the levels of self-efficacy beliefs of pre-service special education teachers and special education teachers, and examine their perceptions, as well as the effect of a range of independent variables regarding the demographic characteristics of special education teachers and the levels of their self-efficacy beliefs.

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## Appendix

### Scale of didactic self-efficacy of parallel support teachers (TSES.GR-ParSup)

1. To what extent can you provide an alternative explanation or an example when the student you support find it difficult to understand something you taught?	1	2	3	4	5	6	7
2. To what extent can you control your student's distraction behaviors?	1	2	3	4	5	6	7
3. To what extent can you help your student appreciate the value of learning?	1	2	3	4	5	6	7
4. To what extent can you answer demanding questions asked by your student?	1	2	3	4	5	6	7
5. To what extent can you prevent a "difficult" student from disrupting the lesson?	1	2	3	4	5	6	7
6. To what extent can you improve the comprehension ability of the student you have for parallel support?	1	2	3	4	5	6	7
7. To what extent can you assess if your student has understood what has been taught?	1	2	3	4	5	6	7
8. To what extent can you get your student to comply with classroom rules?	1	2	3	4	5	6	7
9. To what extent can you motivate your student if he / she shows reduced interest?	1	2	3	4	5	6	7
10. To what extent can you ask your student appropriate and comprehensible questions during the lesson?	1	2	3	4	5	6	7
11. To what extent can you deal with your student if he / she is unruly?	1	2	3	4	5	6	7
12. To what extent can you make your student believe that he / she can do well in school tasks?	1	2	3	4	5	6	7
13. To what extent can you apply alternative teaching methods to your student?	1	2	3	4	5	6	7
14. To what extent can you calm your student down if he / she is annoying or making a fuss?	1	2	3	4	5	6	7
15. To what extent can you adjust the lesson to the level of your student?	1	2	3	4	5	6	7
16. To what extent can you help your student's family to help their child do well in school?	1	2	3	4	5	6	7
17. To what extent can you involve your student if he/she is indifferent to the learning process?	1	2	3	4	5	6	7
18. To what extent can you use different methods to assess your student's performance?	1	2	3	4	5	6	7
19. To what extent can you follow the rules you set in order for the course to run smoothly?	1	2	3	4	5	6	7
20. To what extent can you make your expectations for your students' behavior clear?	1	2	3	4	5	6	7
21. To what extent can you establish a management system for your student?	1	2	3	4	5	6	7
22. To what extent can you encourage your student's creativity?	1	2	3	4	5	6	7
23. To what extent can you give the appropriate challenges to your student?	1	2	3	4	5	6	7
24. To what extent can you help your student think critically?	1	2	3	4	5	6	7