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Research paper

How conception of students' intelligence, need satisfaction and frustration relate to teaching practices and self-efficacy in special education teachers

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ABSTRACT

Preserving special education (SE) teachers' wellbeing and psychological needs has become a challenge in the last decade. The current study aims to examine the relationship between conception of students' intelligence, need frustration and satisfaction, teaching practices and self-efficacy in lower and upper school levels. The sample consisted of 294 SE teachers, who completed a battery of questionnaires about conception of students' intelligence, psychological needs, teaching practices and self-efficacy. The path model showed that an incremental conception of intelligence was positively associated with need satisfaction, which in turn was related to self-efficacy, and that an entity conception of intelligence was positively associated with need frustration, which was positively related to teacher-directed practices. The results of this study can be used to develop professional training programs for SE teachers on growth-oriented beliefs and self-efficacy enhancement, particularly for secondary education teachers, who might use more directive practices.

1. Introduction

In the international debate on teaching quality, there is broad consensus on prioritizing student-oriented approaches which promote active learning and the development of competencies beyond the mere transmission of content (Claxton & Lucas, 2015). However, teaching quality does not depend solely on methodological choices; rather it is shaped by the interaction between teachers' personal factors (e.g., pedagogical beliefs, self-efficacy, motivation, professional competencies and practices) and organizational and contextual conditions (e.g., school climate, leadership, resources, opportunities for ongoing professional development). In this context, special education (SE) teachers, who support the inclusion of students with disabilities or special needs, play a pivotal role as collaborative leaders (Sindelar et al., 2010). Research indicates that students with disabilities tend to achieve better outcomes when supported by SE teachers (Feng & Sass, 2013). Therefore, it is crucial to focus on the processes underlying effective teaching approaches enhancing students' active engagement in managing their learning.

1.1. Teacher-directed vs. student-centered practices

Heterogeneous teaching practices coexist within schools. Lerkkanen et al. (2016) distinguish between teacher-directed teaching practices, rooted in behaviorism and direct instruction, characterized by high levels of control, emphasis on facts and procedures, uniform tasks, and limited personalization (Pakarinen et al., 2024; Reeve & Cheon, 2021; Stipek & Byler, 2004); and student-centered practices, grounded in sociocultural perspectives, which assign learners an active role in constructing knowledge, promoting disciplinary dialogue and critical thinking, and emphasizing individualized objectives and autonomy. On average, student-centered practices are associated with better educational outcomes (Dole et al., 2016; Goodwin, 2024; Lerkkanen et al., 2016).

The adoption of these approaches varies across school levels. In early childhood education and the initial levels of primary school, student-centered practices (e.g., play, guided inquiry, collaboration, and learning by doing) are more prevalent. This approach aligns with developmental needs and is associated with favourable socioemotional

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outcomes (motivation, self-esteem, reduced anxiety) as well as longitudinal benefits for adaptive behaviour (Alfieri et al., 2011; Barnett et al., 2008; Fisher et al., 2013; Hirsh-Pasek, 1991; Lerkkanen et al., 2012; Pakarinen & Kikas, 2019; Vaisarova & Reynolds, 2022). In contrast, the transition to secondary education is often accompanied by increased curricular constraints, which tend to favour more teacher-directed teaching practices (e.g., lecture-based instruction, structured demonstrations) (Mladenovici et al., 2022; Murphy et al., 2021; Sørensen et al., 2023; Woods & Copur-Gencturk, 2024).

1.2. Teachers' psychological needs according to self-determination theory

Consistent with Self-Determination Theory (SDT; Ryan & Deci, 2000), the satisfaction/frustration of teachers' basic psychological needs (autonomy as the experience of volition and psychological freedom, competence as the feeling of being able, and relatedness as the feeling to belong and connect with others) is closely linked to the adoption of motivating or demotivating teaching styles (Moè & Katz, 2020, 2021). In particular, the satisfaction of these needs has been associated with positive emotions, greater professional engagement, more self-determined conduct, and autonomy-supportive practices, which in turn foster students' effective study management, sense of competence, and commitment to self-regulated learning (Jin et al., 2022; Martela & Sheldon, 2019; Matosic et al., 2016; Moè et al., 2022; Ryan & Deci, 2000; Stebbings et al., 2011; Taylor et al., 2008). Conversely, the frustration of these needs is associated with higher stress and burnout and with more controlling or disorganized classroom management styles (Huić et al., 2024; Wang et al., 2024a; Wang et al., 2024b).

Moreover, within co-participatory learning activities, teachers' capacity to respond to students' needs is positively related to autonomy-supportive and structuring teaching approaches and drives the students' autonomous motivation and increase their engagement in school activities (Wang et al., 2024c; Wang et al., 2024a). For example, teachers can support students' need for competence by providing structure as clear and explicit instructions or meaningful help, providing tasks of optimal difficulty. In particular, they can support students' need for autonomy by stimulating interest and challenges, creating opportunities for personal initiatives, matching learning tasks with students' interests and aims, providing the opportunity to make their own choices. Moreover, teachers can support students' need for relatedness creating a collaborative classroom climate, opportunities of interrelationships and peer tutoring (Jang et al., 2010).

Concerning differences across school levels, in early childhood and primary education, the emphasis on educational relationships, greater continuity with the class group, and organisational/methodological flexibility tends to support the satisfaction of autonomy, competence, and relatedness needs (Curby et al., 2022; Hatton-Bowers et al., 2023). By contrast, in secondary education, the combination of evaluative pressure (frequent testing, examinations, standardisation) and curricular constraints (tight timetables, subject-based programming, large classes) heightens the risk of need frustration, with cascading effects on instructional practices (Aelterman et al., 2019; Bartholomew et al., 2011; Ha et al., 2025; Jang et al., 2016).

Given the universality of the needs for autonomy, competence and relatedness, as postulated by SDT, the relationship between the satisfaction of student needs and the teacher's actions to support these needs is also valid in special education conditions to support students' learning motivation. Especially under these conditions, there is a strong dependence of student motivation on the teacher and a high interconnection between teachers' practices to support autonomy, involvement and structure and students' needs, more than occurs in typically developing students (Haakma et al., 2017).This can be interpreted in the light of the heterogeneity of groups of students with special needs who, despite sharing the same condition, present very different strengths and weaknesses, creating real challenges for teachers (Esqueda Villegas et al., 2025).

Kupers et al. (2024) compared the Theory of Planned Behavior (TPB) and Self-determination theory (SDT) to investigate which of the two had greater predictive power with respect to teachers' ability to adopt inclusive and differentiated practices and found that SDT had strong predictive power with respect to the autonomy component. In short time the TPB was more useful to explain concrete behavioural intentions, whilst in long term the SDT accounted for experiencing agency and self-determined motivation as factors to engage in differentiated practices.

Monacis et al. (2023) applied the SDT framework on the educational context to foster special needs teachers' development of metacognition and psychological wellbeing, and underlined the key role of SN teacher's behaviors in supporting students' autonomy through clearer explanations, actions to increase student's self-perception and autonomy language, resulting in a positive influence on students' learning motivation and academic achievement.

1.3. Teachers' sense of efficacy

Teacher self-efficacy refers to teachers' belief in their capacity to effectively achieve their professional goals, and is connected to students' academic achievement, learning motivation and engagement (Zee & Koomen, 2016). Several studies indicate that teachers' self-efficacy is generally positively associated with students' outcomes, although the strength of this association tends to be modest on average. A meta-analysis of Ma et al. (2025) on 71 studies confirms that teacher self-efficacy is a significant predictor of student achievement, with no differences across school levels. Similarly, Klassen and Tze (2014) reported an overall modest association between teachers' self-efficacy and students' perceptions of teaching effectiveness, while Kim and Seo (2018) found small average effect on academic outcomes.

Despite its generally limited impact on students' academic achievement, teacher self-efficacy appears particularly relevant for the motivational and relational processes that sustain classroom participation. Longitudinal studies indicate that teachers with higher self-efficacy, especially in classroom management, indirectly foster greater student engagement and a more positive emotional climate (Lazarides et al., 2022; Hettinger et al., 2024). Moreover, high levels of self-efficacy are associated with greater work engagement and positive affect, whereas lower levels are linked to stress and more controlling instructional styles (Lipscomb et al., 2022). In addition, teachers' self-efficacy is related to greater job satisfaction (Viel-Ruma et al., 2010) and tend to increase with teaching experience (Sun & Yin, 2025).

Research on SE teachers reports higher levels of teachers' self-efficacy than mainstream teachers (Gebhardt et al., 2015), which is, in turn, associated with higher SE student self-efficacy, with positive consequences in implementing inclusive education successfully (Schwab, 2019). Furthermore, SE teachers' self-efficacy is positively correlated with more favourable attitudes towards inclusive education for children with diverse educational needs (Yada & Savolainen, 2017). Overall, findings seem to converge on the association between self-efficacy in teaching and teaching practice with students with disabilities and special needs (Levi et al., 2013; Malinen et al., 2013).

Sun and Yin (2025) examined self-efficacy across school levels and found that primary school teachers belong to high self-efficacy profile, whereas teachers from secondary schools belonged to the low self-efficacy profile. More broadly, early childhood and primary education, which are characterized by strong relational continuity and active methodologies, tend to show higher and more stable levels of teacher self-efficacy (OECD, 2025), with downstream effects on the use of cooperative learning, educational technologies, and learning by doing (Catalano et al., 2022; Martin & Sass, 2010). In secondary education, increasing institutional constraints and evaluative pressure may render self-efficacy more variable or downward-trending, with a greater likelihood of reliance on lecturing, rigid rule enforcement, and punitive practices; however, when self-efficacy is high, cooperative and

student-engagement practices are observed even in these settings (Wang et al., 2024a; Wang et al., 2024b). Overall, evidence suggests that self-efficacy is higher in primary than in secondary education, although recent large-scale and systematic comparison remains limited (Liu et al., 2024; Pierre & Worrell, 2003).

1.4. Implicit theories on students' intelligence

Beyond self-efficacy, teachers' conceptions of students' intelligence play a significant role in shaping teaching practices. According to Dweck (2006), two primary of mindset can be distinguished: a fixed mindset, which is the belief that abilities and intelligence are innate and immutable, and a growth mindset, which conceptualizes abilities and intelligence as malleable and that can be enhanced through effort. In educational setting, the theory of Dweck can be related to the implicit theories that teachers hold about their students. Specifically, the incremental conception (corresponding to the growth mindset) defines students' intelligence as developable through effort and supports the adoption of learning objectives aimed at enhancing skills and abilities. In contrast, the entity conception (i.e., the fixed mindset) considers students' intelligence as fixed and uncontrollable, emphasizing performance objectives centered on demonstrating competence (Dweck, 2006, 2013; Dweck & Leggett, 1988; Elliott & Dweck, 1988). In the school context, an incremental conception is associated with socio-constructivist practices (targeted feedback, educational use of error, promotion of autonomy and cooperation). Conversely, an entity conception is linked to more traditional and directive strategies and less attention to the pedagogical relationship (Catalano et al., 2022; Dweck, 2013). Even when implicit, these assumptions shape students' motivation and engagement; entity-framed messages can prompt negative self-attributions when effort does not yield successful performance (Yeager et al., 2022).

Research focusing on SE teachers showed mixed results, depending on the disability type and age group. A study of Choh and Quah (2000) reported that SE teachers, especially the older ones, tend to hold an incremental rather than an entity conception of their students' intelligence. Similarly, Gutshall (2013) showed a similar proportion in the teachers' views of incremental and entity abilities of students with or without learning disabilities. On the other side, Enea-Drapeau et al. (2017) found a higher proportion of entity classifications addressed to people with Down Syndrome from professionals working with people with intellectual disabilities.

Comparative research on differences in teachers' intelligence conceptions across school levels remains limited. International data indicate that in early childhood and primary education, incremental conceptions tend to predominate, whereas in secondary education, greater evaluative pressure and a more senior teaching corps are associated with entity conceptions (OECD, 2025). Recent evidence integrates the different constructs, showing that an incremental conception of intelligence, combined with high teaching self-efficacy, is associated with a greater likelihood of adopting student-centered practices (Catalano et al., 2022; Gullo et al., 2025).

Across school levels, student-centered practices appear to be more prevalent in the early years (preschool/primary school), together with greater satisfaction of needs, higher self-efficacy and more incremental conceptions (Alfieri et al., 2011; Catalano et al., 2022; Fisher et al., 2013; Goodwin, 2024; Lerkkanen et al., 2012). In secondary school, increasing structural constraints and assessment pressure are associated with greater frustration, lower self-efficacy and more frequent adoption of teacher-directed practices. Consistently, teachers' conceptions tend to become more entity-oriented (Catalano et al., 2022; Vermote et al., 2020).

1.5. The current study

To our knowledge, no integrated studies have examined SE teachers across different school levels (kindergarten, primary, middle, and high school) considering their basic psychological needs satisfaction/frustration, self-efficacy, conceptions of intelligence and orientation of practices (teacher-directed vs student-centered). From a SDT perspective, the integrative approach is particularly relevant as teachers' motivation results from a dynamic interaction between contextual conditions and individual beliefs supporting or thwarting their basic psychological needs (Deci et al., 2017; Vansteenkiste & Ryan, 2013). Recent research within the SDT framework has also highlighted the role of teachers' motivational beliefs and mindsets in shaping motivating or demotivating teaching styles. For instance, teachers' motivational orientations and beliefs about learning influence teachers' adoption of autonomy-supportive or controlling instructional approaches (Vermote et al., 2020, 2023). Moreover, the role of professional experience has been rarely systematically assessed, as findings remain heterogeneous and inconclusive (Douwes-van Ark et al., 2025; Dweck, 2006; Liu et al., 2023).

The present study addresses this gap by providing a cross-sectional comparison by school level in Southern Italy. The Italian school system is a public education system consisting of four school levels starting from kindergarten (from 3 to 6 years), where attendance is optional, while mandatory education starts with primary school (from 6 to 11 years), followed by middle school (11 to 14 years) and high school (from 14 to 18 years). Middle school provides general education in subject-specific areas, while high school includes different curricula (from classic studies, linguistic studies, technical studies, scientific studies, and so on). Concerning teachers' education, the Italian system requires a specific degree in education for kindergarten and primary school teachers, while for middle and upper secondary school, teachers may have different degrees according to the type of school.

Consistently with SDT, teachers' belief systems may shape their motivational functioning by influencing how they interpret students' learning processes. Several studies suggest that teachers endorsing incremental beliefs tend to display high levels of satisfaction and higher self-efficacy (Klaeijsen et al., 2018; Moè & Katz, 2022; Nalipay et al., 2019). Incremental beliefs may align with autonomy-supportive orientation since they emphasize growth, effort and competence development. In turn, teachers whose psychological needs are satisfied tend also to adopt motivating and innovative teaching practices that support students' active development (Moè & Katz, 2022), whereas teachers holding entity conception seem to be less satisfied than teachers with incremental beliefs (Nalipay et al., 2019). Furthermore, teachers with high need frustration levels also tend to show lower levels of self-efficacy and to adopt more controlling teaching styles (Keller et al., 2024). The model of Gullo et al. (2025) confirmed that an incremental conception of students' intelligence and teachers' need satisfaction positively correlates with teachers' self-efficacy and student-centered teaching practices, whilst an entity conception of students' intelligence and need frustration is associated with lower levels of self-efficacy and a teacher-directed approach.

To our knowledge, these associations have not been systematically assessed among SE teachers. In special education, teachers' interpretations of students' difficulties are central for decision-making, and the beliefs about students' intelligence might be associated with the way teachers interpret students' difficulties and growth potential, which is crucial for students with special needs. From a SDT perspective, SE teachers work in context with structural constraints, which makes the basic psychological needs particularly salient. The satisfaction of teachers' basic psychological needs should result in a higher self-efficacy and a more student-centered tendency, which should have positive motivational effects on students with special needs (Guo & Xu, 2024). Therefore, we aimed to explore the associations between teachers' beliefs about students' intelligence (from more entity-oriented to more incremental-oriented views), their basic psychological needs, and the teaching practices they usually adopt (from more teacher-directed to more student-centered).

1.6. Hypotheses

Based on the previous research by Gullo et al. (2025) which identified teachers' beliefs about students' intelligence and need satisfaction and frustration as associated with self-efficacy and teaching practices, the current study highlights the differences among teachers of different school levels. Specifically, we hypothesize that.

1) Secondary school teachers will experience lower levels of need satisfaction and higher levels of need frustration, as well as lower self-efficacy. No specific hypothesis is made upon teachers' beliefs about students' intelligence;
2) Secondary school teachers tend to adopt student-centered practices to a lower extent than teachers from the other school levels;
3) Teachers who hold a more incremental-oriented conception of intelligence, together with teaching at lower school grades, will report lower need frustration and higher need satisfaction. Higher need satisfaction, in turn, will be associated with higher use of student-centered practices.

2. Methods

The sample was recruited through announcements during the specialization course for SE teachers in different University courses, specifying that participation in the online survey was voluntary and not rewarded. The initial sample consisted of 305 participants, 11 of whom did not complete the survey. Therefore, the final sample was made up of 294 participants. Most of the teachers were female (90.8%), lived in Southern Italy, specifically from Sicily (98%), had a mean age of 39.9 years (SD: ±9.03) and reported a university degree (54.4%). Concerning the school level, participants were mainly from primary school (43%) and high school (45%), while the 4% was from kindergarten and the 9% was from middle school. The study was conducted respecting the Declaration of Helsinki principles and was approved by the Bioethical Committee of the University of Palermo, approval nr. 2758/2024.

2.1. Measures

2.1.1. Basic psychological need satisfaction and frustration scale

The Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015; Liga et al., 2020) assess the level of need satisfaction and need frustration through 24 items measuring teachers' psychological needs according to the Self-Determination Theory (Ryan & Deci, 2000): autonomy satisfaction (4 items), autonomy frustration (4 items), competence satisfaction (4 items), competence frustration (4 items), relatedness satisfaction (4 items), relatedness frustration (4 items). Items were rated on 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). Two indicators were used for the study, namely the need frustration (obtained through the raw sum of the autonomy frustration, competence frustration and relatedness frustration items) and the need satisfaction scores, calculated through the raw sum of the autonomy satisfaction, competence satisfaction and relatedness satisfaction items. For both subscales, the scores ranged from 12 to 60. The two subscales have a very good reliability (Need Satisfaction: $\alpha = 0.88$ and Need Frustration: $\alpha = 0.85$).

2.1.2. Student-oriented vs teacher-centered teaching practice scale

The Teacher/student-oriented practice questionnaire (Gullo et al., 2025) was adopted to assess the teachers' tendency to adopt more directed or student-centered practices. This measure is a self-reported questionnaire of 12 items evaluated on a 7-point bipolar scale, where one extreme represents a student-oriented practice (e.g., *"My rules and my classroom routines are flexible"*), while the opposite end represents the teacher-oriented version of the same practice ("*My rules and my classroom routines are not easily modifiable"*). The total score ranges from 12 to 84. The scale is inspired by the Early Childhood Classroom Observation Measure - ECCOM observational checklist (Lerkkanen et al., 2016; Stipek & Byler, 2004) which identifies teachers' behaviours within the classroom that can be considered teacher-directed or student-centered. A higher score corresponds to the adoption of student-centered practices. The reliability of the scale was very good (Cronbach's $\alpha = 0.85$).

2.1.3. Teacher sense of efficacy scale

Teacher Sense of Efficacy Scale - TSES (Tschannen-Moran & Hoy, 2001) was used to detect teachers' self-efficacy at school. The measure consists of 12 self-reported items measuring self-efficacy related to instructional strategies, efficacy for classroom management, and efficacy for student engagement. Participants evaluate each item on a 9-point Likert scale, from 1 indicating "nothing" to 9 indicating "a great deal", regarding their ability to manage the classroom in specific situations (e.g., "How much can you do to control disruptive behaviour in the classroom"; "How much can you do to motivate students who show low interest in schoolwork"). The total score ranges from 12 to 108. The scale had excellent internal consistency (Cronbach's $\alpha = 0.95$)

2.1.4. Teacher conception of intelligence scale

The Teacher Conception of Intelligence Scale – STCI (Gullo et al., 2025) was used to evaluate teachers' beliefs about the students' intelligence. The scale assesses the incremental nature of intelligence ("students can learn a lot of things, but their ability cannot be changed"), the perception of controllability or uncontrollability of efforts ("Life results depend on one's efforts") and educational strategies that aim for praise or punishment based on skills ("Praising students' efforts prepare them to successfully overcome life obstacles"), through 18 items on a scale from 1 ("Absolutely agree") to 6 ("Absolutely disagree"). The total score ranges from 18 to 108. Higher scores indicate a stronger incremental orientation. The scale has adequate internal consistency (Cronbach's $\alpha = 0.71$).

2.2. Data analysis

Data were analysed through the R software with RStudio interface (version nr. 2026.01.0 + 392). Descriptive statistic is presented in Table 1. Since the sample was unbalanced concerning the four school levels, we divided the sample into "lower school level" (n = 137), consisting of kindergarten and primary school SE teachers, who share the same university degree in early school education, and "upper school level" (n = 157), consisting of lower and upper secondary school teachers, who may have different specializations. To assess the differences between school levels, an Analysis of CoVariance (ANCOVA) model was used using teaching experience (i.e., number of years in service) as a continuous covariate and school level (i.e., lower vs upper school level) as a categorical grouping factor. Correlations between variables were evaluated through Pearson's R, while a path analysis model with bootstrap confidence intervals was run through the package *lavaan* using the Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimator, which is particularly suitable for models with ordinal variables. Specifically, the path analysis model assumes that teachers' conception of intelligence, together with school grade, is related to the need frustration and satisfaction, which, in turn, are related to teachers' self-efficacy and teaching practices. Finally, following Podsakoff et al. (2003), the common method variance will be assessed by conducting Harman's single-factor test using a principal component analysis of all item-level variables.

3. Results

3.1. Differences in psychological needs, self-efficacy, teaching practices and conception of students' intelligence according school levels

The results of the ANCOVA model (see Table 2) relating teaching practices showed a significant difference across school levels ($F_{1,291}$ =

Table 1
– Descriptive statistics of the sample.

	Total Sample (n = 294)				Lower School Level (n = 137)		Upper School Level (n = 157)		Difference	
	Mean	SD	Min	Max	Mean	SD	Mean	SD	t-value	*p*
Age	39.91	9.03	19	60	43.46	8.15	36.81	8.62	6.79	<0.001***
Years of Experience	2.96	4.16	0	21	3.59	4.36	2.41	3.91	2.44	0.015*
Conception of students' intelligence	59.97	8.08	36	78	60.88	6.70	59.17	9.07	1.82	0.069
Teaching practices	47.82	10.14	16	63	50.01	7.59	45.90	11.62	3.53	<0.001***
Need frustration	22.97	7.83	12	60	22.50	7.41	23.38	8.18	−0.96	0.338
Need Satisfaction	50.96	6.00	31	60	50.88	5.04	51.04	6.74	−0.23	0.817
Self-efficacy	81.43	13.47	12	108	82.73	13.52	80.29	13.36	1.56	0.121

Legenda: ***$p < 0.001$; *$p < 0.05$.

Table 2
– ANCOVA model results.

Dependent variable	Predictor	F (1,291)	p	Partial η^2
Teaching Practices				
	School Level	11.22	<0.001***	0.04
	Years of Experience	1.02	0.31	0.00
Conception of intelligence				
	School Level	3.35	0.06	0.01
	Years of Experience	0.04	0.84	0.00
Need Frustration				
	School Level	1.40	0.24	0.00
	Years of Experience	2.67	0.10	0.01
Need Satisfaction				
	School Level	0.04	0.84	0.00
	Years of Experience	0.04	0.85	0.00
Teachers' Self-Efficacy				
	School Level	1.61	0.20	0.01
	Years of Experience	3.89	0.04*	0.01

Legenda: ***$p < 0.001$; *$p < 0.05$.

11.22, $p < 0.001$), while teaching experience was not associated ($F_{1,291} = 1.02$, $p = 0.31$). Specifically, from post-hoc analysis, lower school level scored higher than upper school level (mean difference: 6.26, SE = 2.18, t = 2.87, df = 289, $p = 0.02$), meaning that lower school level teachers tend to use student-centered practices in a more extent than upper school level teachers. Regarding self-efficacy, no difference on school level ($F_{1,291} = 1.61$, $p = 0.21$) was retrieved, but an association with teaching experience ($F_{1,291} = 3.89$, $p = 0.049$) was found. Concerning need frustration, no differences emerged between school levels ($F_{1,291} = 1.40$, $p = 0.23$), nor teaching experience ($F_{1,289} = 2.67$, $p = 0.10$), as well as need satisfaction (school level: $F_{1,291} = 0.04$, $p = 0.84$; teaching experience: $F_{1,291} = 0.04$, $p = 0.85$). Finally, teachers did not report significant differences in the conception of intelligence according to the school level (school level: $F_{1,289} = 3.35$, $p = 0.06$), and teaching experience did not have any association ($F_{1,289} = 0.04$, $p = 0.85$)Fig. 1.

3.2. Correlations among variables

Correlations among variables are presented in Table 3. Need frustration is inversely correlated to need satisfaction ($r = -0.405$, $p < 0.001$), student-oriented practices ($r = -0.388$, $p < 0.001$), self-efficacy. ($r = -0.350$, $p < 0.001$), and an incremental conception of students' intelligence ($r = -0.388$, $p < 0.001$). Conversely, need satisfaction is positively correlated to student-oriented practices ($r = -0.161$, $p < 0.01$), self-efficacy ($r = 0.508$, $p < 0.001$), and an incremental conception of students' intelligence ($r = 0.304$, $p < 0.001$). Moreover, self-efficacy is positively related to an incremental conception of intelligence ($r = 0.303$, $p < 0.001$).

3.3. Path analysis model

The path analysis model showed an excellent fit ($\chi^2 = 6.68$, df = 5, $p = 0.25$; CFI = 0.99, TLI = 0.97, RMSEA = 0.03, SRMR = 0.03) . Standardized coefficients are presented in Table 4, and a visual representation of indirect effects is reported in Fig. 2.

Teachers' conception of intelligence was negatively correlated with school level ($\beta = -0.12$, SE = 0.52, $z = -2.24$, $p = 0.04$), indicating that an incremental conception of intelligence is correlated with lower school grades. Conception of intelligence was positively associated with need satisfaction ($\beta = 0.30$, SE = 0.05, $z = 4.38$, $p < 0.001$) and negatively associated with need frustration ($\beta = -0.38$, SE = 0.06, $z = 5.14$, $p < 0.001$). Moreover, the conception of intelligence was also positively associated with self-efficacy ($\beta = 0.16$, SE = 0.10, $z = 2.88$, $p < 0.001$) and student-centered practices ($\beta = 0.33$, SE = 0.08, $z = 5.43$, $p < 0.001$). Need satisfaction was positively associated with self-efficacy ($\beta = 0.46$, SE = 0.12, $z = 8.80$, $p < 0.001$), whereas need frustration was negatively associated with student-centered practices ($\beta = -0.25$, SE = 0.08, $z = -4.04$, $p < 0.001$). Finally, school level showed a negative association with student-centered practices ($\beta = -0.13$, SE = 0.50, $z = -2.46$, $p = 0.01$).

Moreover, path analysis confirmed that two indirect associations emerged. Conception of intelligence showed an indirect association with self-efficacy via need satisfaction ($\beta = 0.14$, SE = 0.06, $z = 4.09$, $p < 0.001$). Conception of intelligence was also indirectly associated with student-centered practices through need frustration ($\beta = 0.09$, SE = 0.04, $z = 3.05$, $p = 0.002$).

Concerning total effects, conception of intelligence showed overall association with self-efficacy ($\beta = 0.30$, SE = 0.10, $z = 5.15$, $p < 0.001$), and student-centered practices ($\beta = 0.42$, SE = 0.07, $z = 7.54$, $p < 0.001$), combining direct and indirect paths.

Regarding a possible common method variance, we conducted the Harman's single factor test using a principal component analysis of all item-level variables. The results showed that the first factor accounted for 20.58% of the total variance, which is far below the 50% threshold, indicating that it is unlikely that common method variance biased our results.

4. Discussion

Improving teaching quality while preserving teachers' wellbeing and satisfying psychological needs at all school levels has become a challenge in the last decades, as a result of growing demand for special education provision and the persistent gaps between policy and actual education practice (Farr et al., 2026). It is also an urgency underlined by Goal 4.5 of the United Nation's agenda 2030 which reiterates "equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations" (UN General Assembly, 2015).

The current study aimed to assess SE teachers' needs and self-efficacy, analyzing their relationship with their beliefs about students' intelligence and the practices adopted within the classroom, also considering the school grade where they teach. In particular, we

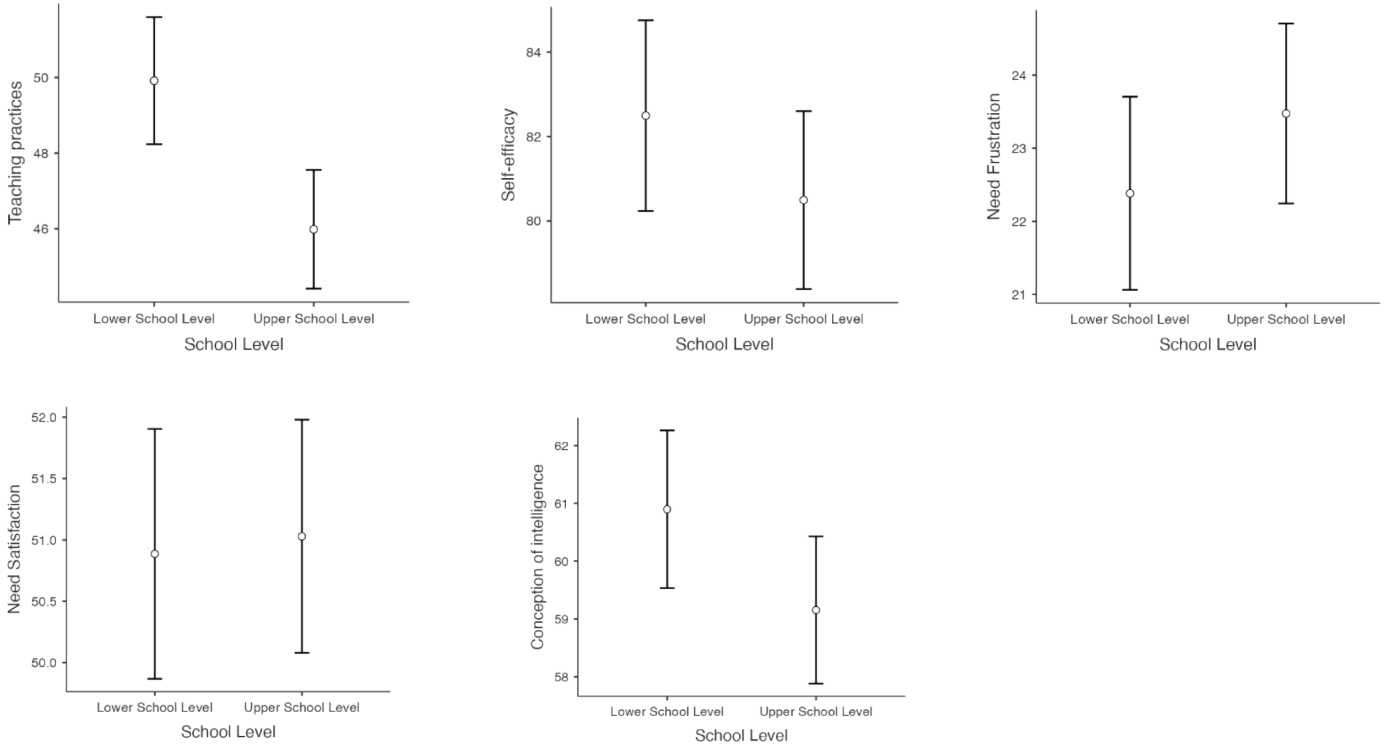

Fig. 1. – Differences in teaching practices, teachers' conception about student intelligence, self-efficacy, and need frustration and satisfaction across school levels.

Table 3
– Intercorrelation among variables.

	1	2	3	4	5
Need Frustration (1)	—				
Need Satisfaction (2)	−0.405***	—			
Teaching Practices (3)	−0.388***	0.161**	—		
Self-efficacy (4)	−0.350***	0.508***	0.274***	—	
Conception of Intelligence (5)	−0.377***	0.304***	0.436***	0.303***	—

Legenda. **p < 0.01, ***p < 0.001.

Table 4
Path coefficients.

Path	β	SE	z	Bootstrap Confidence Intervals	
Direct effects				Lower	Upper
Teaching Practices					
Need Frustration → Teaching Practices *(b1)*	−0.25***	0.08	−4.04	−0.32	−0.16
Conception of Intelligence → Teaching Practices *(b2)*	0.33***	0.08	5.43	0.26	0.56
School Level → Teaching Practices *(b3)*	−0.12*	0.52	−2.24	−2.23	−0.21
Self-efficacy					
Need Satisfaction → Self-Efficacy *(a2)*	0.46***	0.12	8.80	0.82	1.28
Conception of Intelligence → Self-Efficacy *(a1)*	0.16***	0.10	2.88	0.08	0.45
Need Satisfaction					
Conception of Intelligence → Need Satisfaction *(d1)*	0.30***	0.05	4.38	0.33	0.23
Need Frustration					
Conception of Intelligence → Need Frustration *(d2)*	−0.38***	0.06	−5.14	−0.22	−0.37
Indirect effects					
Conception of intelligence → Need satisfaction → self-efficacy	0.14***	0.06	4.09	0.12	0.35
Conception of intelligence → Need frustration → teaching practices	0.09**	0.04	3.05	0.04	0.19
Total Effects					
Total effect of Self-Efficacy	0.30***	0.10	5.15	0.31	0.69
Total effect of Teaching Practices	0.42***	0.07	7.54	0.39	0.67

Legenda: ***p < 0.001; **p < 0.01; *p < 0.05.

hypothesized that upper schoolteachers would report a lower level of need satisfaction and the highest level of need frustration, as well as lower self-efficacy. SE teachers are an underrepresented population in the scientific literature concerning the application Self-Determination Theory in the school context. Yet, the understanding of their motivational processes is particularly important as SE teachers support the inclusion and the learning processes of children with disabilities (Feng & Sass, 2013).

From a SDT perspective, the satisfaction of basic psychological needs, namely autonomy, competence and relatedness, could be associated with agentic functioning, characterized by proactive engagement, confidence and effective professional behaviour (Vansteenkiste & Ryan, 2013). These aspects are crucial for SE teachers, as they work in a demanding professional context, where they are often exposed to elevated stress and increased turnover or burnout. Regarding teachers' psychological needs, in the current study no differences emerged in terms of need satisfaction and frustration between lower and upper school level teachers. Similar results were found by Wiyono (2016), who did not find differences between across school levels. Indeed, preserving SE teachers' psychological needs is strongly connected to their wellbeing (Bozgeyikli, 2018).

Furthermore, self-efficacy is particularly relevant for SE teachers, as SE teachers with higher self-efficacy are more likely to use adaptive teaching strategies, provide individualized support, and persist when students encounter difficulties (Levi et al., 2013). Previous studies found that kindergarten and primary school teachers reported higher self-efficacy levels than secondary school teachers (Klassen & Chiu,

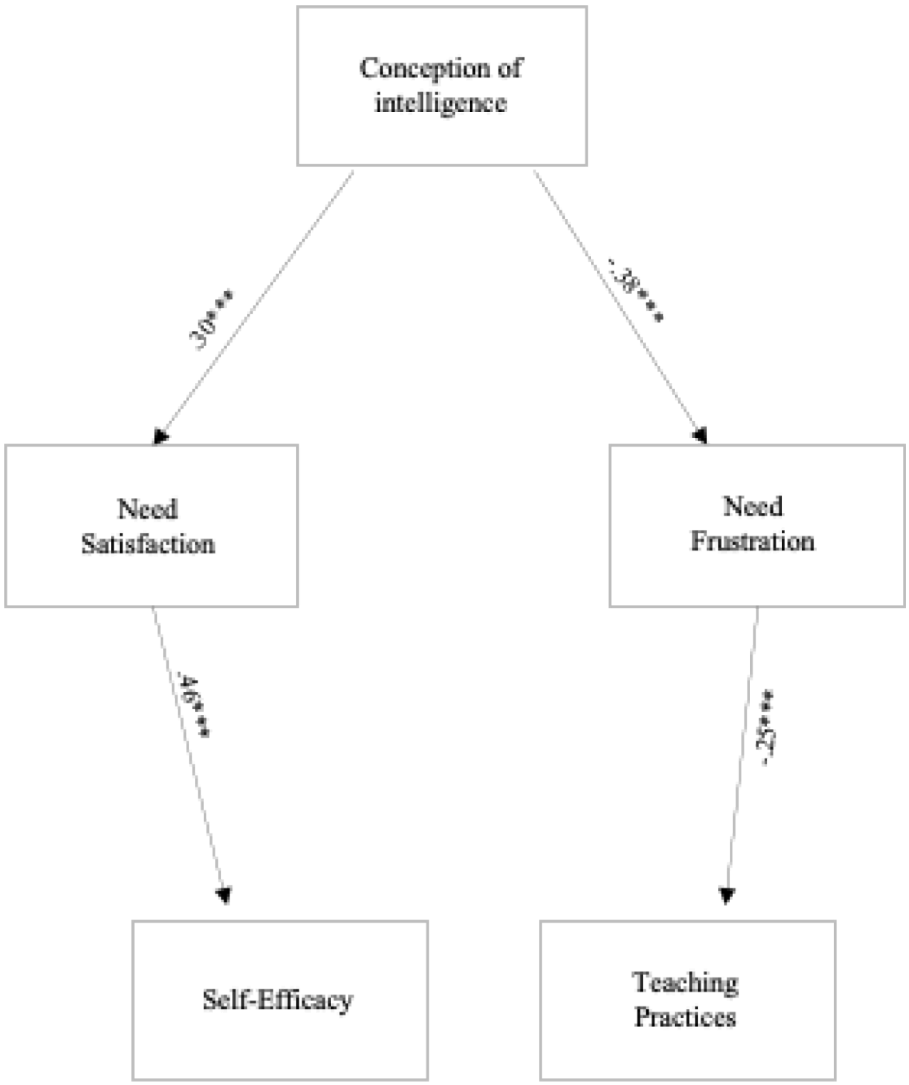

Fig. 2. Path analysis model.

2010; Lee et al., 2013). According to Ryan et al. (2015), this difference might be related to the fact that secondary school teachers are more likely to be challenged by students, who are in puberty, thus immersed in physical and psychological changes. Regarding students with SN, secondary school is more challenging in terms of both social and academic demands and often the school responds by providing students less opportunities for exercising autonomy, for example by imposing classroom tasks rather than giving opportunities for choice (Esqueda Villegas et al., 2025). Moreover, teachers' self-efficacy increases with their experience. Kazanopoulos et al. (2022) confirmed that SE teachers with 0-1 years of experience report lower self-efficacy levels than teachers with 6-10 years of experience in special education. Several studies confirmed this result also on mainstream teachers (Fives & Buehl, 2009; Gale et al., 2021; Wolters & Daugherty, 2007), as teaching experience is considered a mastery experience and has a powerful influence on teaching sense of efficacy. Our results did not show differences between lower and upper secondary school teachers, but we found an association with teaching experience, where teachers with increasing years of experience were linked to higher levels of self-efficacy. As discussed by MacCormack et al. (2021), teacher' self-efficacy predicts a positive attitude toward inclusive education and, along with experience, can influence the adoption of inclusive educational practices. Conversely, less experienced teachers with lower levels of self-efficacy, however, require greater support and supportive leadership.

Regarding teachers' beliefs about students' intelligence, our results on SE teachers showed that lower school level teachers tended to report an incremental conception of students' intelligence. Similar results were retrieved by Manuel et al. (2026), who confirmed that SE teachers in high school tend to hold entity beliefs of their students' intelligence although they recognize the importance of inclusive strategies. Concerning mainstream teachers, Catalano et al. (2022) found that lower school level teachers tend to use more active strategies, which are supported by an incremental implicit theory of students' intelligence. Basically, teachers holding an incremental implicit theory of intelligence tend to see students as the primary actors in the acquisition of knowledge (Dweck, 2006). In this sense, pre-school and primary school teachers, who interact with very young students, might see their growth potential, even in the case of students with special needs (Catalano et al., 2022; Falcon et al., 2025).

According to the second hypothesis, higher SE schoolteachers would adopt student-centered practices to a lower extent than teachers from lower school levels. High-school teachers typically struggle with the adoption of student-centered practices (Fufa et al., 2023) for different reasons, such as school time restraints, class size, and lack of student-centered teaching materials. Moreover, Haakma et al. (2017) showed how teachers met difficulties in delivering strategies to fulfill the autonomy need of their students with SN, for time restraints or overprotectiveness. The results confirmed this hypothesis, reporting a

significant difference in teaching practices, where teachers from kindergarten and primary school tend to adopt student-centered practices to a greater extent. This result is in line with previous studies, finding that there are some limitations in the adoption of student-centered practices from primary to secondary schools (Arseven et al., 2016; Maloy & LaRoche, 2010). For instance, Pedersen and Liu (2003) collected qualitative feedback from middle teachers concerning the adoption of student-centered practices, and, although they recognize the importance of using such approach with special needs children, they also maintained that it would require extra effort.

Finally, the path analysis model (see Fig. 2) showed that a less incremental-oriented conception of intelligence was associated with higher need frustration and lower need satisfaction. Low need satisfaction was associated with lower self-efficacy, while high need frustration was associated with the adoption of teacher-directed practices. Furthermore, indirect positive associations emerged between incremental conception and self-efficacy, and between incremental conception and student-centered practices. The results of the model confirm the results of Gullo et al. (2025) and, additionally, show that SE teachers' school level might be a key variable for the adoption of certain teaching practices. Katz and Moe (2024) reported that high need satisfaction was connected to the adoption of motivating teaching styles, such as the student-centered practices, while high levels of need frustration were related to the inclination to engage in self-derogation, like the teacher-directed approach (Pakarinen et al., 2024). Moreover, the result is in line with the model of Catalano et al. (2022), who found that an incremental conception of students' intelligence is connected to higher self-efficacy and to student-centered teaching practices in relation to school level. As reported by Rattan et al. (2012), teachers with an entity implicit theory of intelligence tend to comfort students in case of failure (as teachers with an incremental conception), but the feedback content reflecting this implicit conception tends to impair students' motivation and expectation about their future performance. Moreover, concerning SE teachers, the results of the model are also in line with Manuel et al. (2026), who reported that holding incremental beliefs of students is connected to instructional and relational behaviours, while holding entity beliefs is associated with a more directed approach in teaching.

From the Self-Determination Theory (SDT) perspective, the current study suggests a coherent motivational process connecting teachers' implicit beliefs to their professional functioning: teachers endorsing an incremental conception of their students' intelligence may consider the growth potential in their students and see the difficulties as a part of the learning process. Indeed, when teachers' autonomy, competence, and relatedness are satisfied, they tend to feel confident and agentic in their professional role (Keller et al., 2024).

The relevance of these findings may be particularly useful for SE teachers, who play a key role in supporting the inclusion of students with disabilities and diverse learning needs. Moreover, their professional judgment often consists in interpreting students' learning difficulties and developmental trajectories (Feng & Sass, 2013). In this context, teachers' conception of their students' abilities can influence how teachers interpret challenges and support students' progress. Although the present study does not allow causal conclusions, the observed associations suggest that teachers' beliefs, motivational resources, and instructional orientations may co-occur in relevant ways for inclusive educational practices.

4.1. Limitations and recommendations for future research

The current findings aim to fill a literature gap, which is the relation of psychological needs, teachers' self-efficacy, teaching practices and conception of students' intelligence according to the school level. Moreover, the study focuses on SE teachers, who are an underrepresented category in the scientific literature, by applying the SDT that has proven to be a useful framework for understanding the relationship between meeting the needs for autonomy, competence, and relatedness of students with special needs and effective educational practices for supporting their motivation to study. Consideration and satisfaction of these needs embody the idea that every student is different and respond to the need to take into account interindividual variability (Esqueda Villegas et al., 2025).Despite these merits, the current study comes with some limitations: first, the cross-sectional and correlational nature of the study prevents causal inferences on the proposed model, while longitudinal or cross-lagged designs could better clarify causal relationships among variables. Concerning measures, the use of bipolar scales assumes a unidimensional continuum between entity and incremental beliefs and between teacher-directed and student-centered practices, while literature suggests that these constructs may be partially independent. Therefore, employing multidimensional measures could provide a more detailed understanding. Moreover, the study employed a self-report measure to detect teaching practices. Since the perceived and the adopted teaching practices may differ, especially to what concerns the controlling style (Wang et al., 2024c; Wang et al., 2024a), future research should better investigate these relations.

Another limitation relates the sample, which predominantly consists of female teachers. This is a very common limitation since females tend to respond to online surveys to a greater extent than males (Huddy et al., 1997).

Finally, the study did not assess contextual factors such as school climate, institutional autonomy and inclusive policies, whose absence, in the SDT perspective, limits the ecological depth of the interpretation.

Future research should investigate psychological resources, self-efficacy and beliefs on students' intelligence and their connection to the observed teachers' practices, which allows accounting for more contextual variables. Furthermore, future studies could adopt multidimensional assessment tools to separately measure entity/incremental beliefs or student-centered/teacher-directed practices, and also consider contextual moderators, such as motivational climate, class size, or the presence of inclusive policies. The integration of these factors might enrich the theoretical framework, considering contextual conditions that better sustain teachers' wellbeing, self-efficacy and psychological needs.

These results highlight the importance of fostering adaptive beliefs and supporting teachers' motivational resources at all school levels. Specifically, the current study results can be used to develop professional training programs on growth-oriented beliefs and self-efficacy enhancement, particularly for secondary education teachers, who tend to use more directive practices. Since SE teachers tend to report high burnout and turnover (Sweigart & Collins, 2017), it is also important to promote a supportive environment that enhances teachers' autonomy, relatedness and competence for reducing this risk. Finally, improving SE teachers' motivational resources and self-efficacy might be beneficial for their students, who might experience a better learning environment.

CRediT authorship contribution statement

Ambra Gentile: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Arianna Nicita:** Writing – original draft, Investigation. **Gabriele Gullo:** Writing – review & editing, Methodology. **Giuseppa Filippello:** Writing – original draft, Project administration, Investigation. **Marianna Alesi:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The Authors declare no conflict of interests.

Data availability

Data will be made available on request.

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