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A mediating effect of self-regulated learning between self-assessment and teacher professional development among Chinese high school teachers

Li Mengke
Universiti Putra Malaysia
Riyan Hidayat
riyanyunus160989@gmail.com
SEGi University https://orcid.org/0009-0008-9493-7166
Gazi Mahabubul Alam
Taylor University
Yousef Wardat
Yarmouk University

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The mediating effect of self-regulated learning on the relationship between self-assessment and teacher professional development among secondary teachers

Li Mengke
Universiti Putra Malaysia
Riyan Hidayat
SEGi University
Gazi Mahabubul Alam
Taylor's University
Yousef Wardat
Yarmouk University

Abstract

The inquiry in this study emphasizes the interconnectedness of self-regulated learning (SRL), self-assessment (SA) and teacher professional development (TPD) with junior high school teachers as the target of the study. The mediating effect of self-regulated learning among the interconnectedness is also explored. Correlational research design is utilized in this study to collect information, which constitutes a quantitative as well as predictive correlation study. The questionnaire employs a set of instruments with three dimensions: teacher professional development, self-assessment and self-regulated learning, totaling 45 questions. 392 valid questionnaires were collected using simple random sampling. Statistical tools used Statistical Package for Social Sciences (SPSS) to carry out descriptive analysis and correlation analysis, and Smart PLS to carry out mediating effect analysis. The results show that both teacher professional development and self-assessment share a strong positive correlation, and self-regulated learning has a strong partial mediating effect on self-assessment and teacher professional development. Some practice, theory, and future research recommendations are also provided by this study with the expectation to improve Chinese junior high school teachers' level of professional development and the level of self-regulated learning as a mediating variable.

Keyword: competency-based education, teacher professional development, self-assessment, self-regulated learning

Introduction

Junior high school learning is a crucial stage of students' academic and personal development. Globally, research on teacher professional development (TPD) remains an important and developing area of study in education (Asterhan & Lefstein, 2024; Gràcia et al., 2025). TPD is necessary to increase the quality of teaching and students' learning accomplishment (Jabar et al., 2022; Zhang & Li, 2019). Professional development is among the primary elements of improving teaching quality and student accomplishment (Hidayat et al., 2024). Education studies emphasize lifelong learning and continuous development as important parts of TPD. Teachers are ushered into reflective practice and ongoing education, stressing the imperative of continued skill development in addressing evolving educational demands (Hesterman, 2022). In the new era, Chinese society has placed higher requirements on junior high school education, and at the same time, junior high school teachers are also required to have higher professional qualities (Yang & Lei, 2023).

Previous studies have extensively explored various factors contributing to effective professional development among teachers (He, 2019; Luo & Lin, 2020). Teacher professional philosophy and ethics affect educational practice. In China, due to heavy work pressure and social expectations, some teachers have experienced professional burnout and their enthusiasm for students and education has declined (Zhu, 2019). In China, some teachers tend to formalism in the practice of teacher professional

ethics, which weakens the ethics and humanity of education (Jiang, 2020). Some Chinese teachers, especially in rural areas, have a weak professional knowledge base and cannot meet the needs of high-quality teaching (Luo & Lin, 2020). There is a significant gap between the subject knowledge level of rural teachers in China and urban teachers, which directly affects the academic quality of students (Sun & Cui, 2020). Most Chinese junior high school teachers lack scientific class management skills, which leads to low learning efficiency of students (Kannadass et al., 2023; Li, 2020). The application of educational technology has not yet been popularized, and teachers are not capable of innovative teaching methods. At the same time, teachers often find it difficult to meet the diverse learning needs of students (Mohd Saad et al., 2023; Shi, 2018).

It must also be noted that self-regulated learning (SRL) and self-assessment have been emphasized as major factors. SRL refers to the process of setting plans, monitoring and examining one's own learning activities to increase self-directed and customized professional growth (Cha, 2021). Self-assessment, on the other hand, is where teachers evaluate their instructional approaches and accomplishments, which help them understand better their strength points and shortcomings (OECD, 2020).

Although many studies have been done on self-regulated learning, self-assessment, and teachers' professional development in China by many researchers (Li, 2024). However, most of the research has focused on students' self-regulated learning and students' self-assessment, and few studies have focused on teachers (Jungsub, 2019). Apart from this, there is limited research on the interaction between self-regulated learning, self-assessment, and teacher professional development among Chinese junior high school teachers (Li, 2024). The present study fills the literature gap on the interactions between self-regulated learning, self-assessment, and teacher professional development among Chinese junior high school teachers and is therefore highly valuable. Therefore, this study focuses on the correlational research of self-regulated learning and self-assessment with teacher professional development, and the mediating effect of self-regulated learning on self-assessment and teacher professional development in real Chinese class.

1. What is the relationship between self-regulated learning and teacher professional development of Chinese junior high school teachers?
2. What is the relationship between self-assessment and teacher professional development of Chinese junior high school teachers?
3. Does self-regulated learning play mediating effect between self-assessment and teacher professional development of Chinese junior high school teachers?

Literature review

Self-regulated learning

Pintrich et al. (1990) noted that students' self-regulated learning encompasses three components: metacognitive strategies to plan, monitor, and regulate learning, control over the level of learning effort, and cognitive strategies to enable the learner to comprehend the content. Boekaerts (1999) proposed a model of the elements of self-regulated learning, suggesting that self-regulated learning has a cognitive element and a motivational element that are requirements students must have in the context of self-regulated learning. Zimmerman (2011) unveiled students' learning goals, self-efficacy, and learning strategies as three requirements of self-regulated learning. Bransford (1999) clarified that self-regulated learning involves three elements: motivation, cognition, and metacognition. Self-regulated learning by students encompasses self-efficacy, attribution, goal setting, cognitive strategies, and metacognitive strategies, among others. Self-regulated learning, as Zimmerman (2011) explains, is centered on

learning goals and effort control, a position also advanced by Pintrich et al.

Self-regulated learning can be described as an elaborate process where cognitive and metacognitive techniques, motivational control parameters like setting goals and efficacy, and control of effort in an effective way are all instrumental in enabling long-term and effective learning. The above literature has critically reviewed different self-regulated learning facilitating strategies as well as differing modeling definitions of self-regulated learning. However, few studies have been conducted on Chinese junior high school teachers regarding the interaction between teacher professional development and self-regulated learning.

Self-assessment

Self-assessment is the process by which individuals reflect on and evaluate their own performance after completing a particular activity or task (Andrade, 2019). Self-assessment is an important part of teacher professional development, especially in formative assessment, which provides teachers with an important opportunity to reflect on their teaching practices and optimize their teaching decisions (Andrade, 2019). Teacher self-assessment stands out from other evaluation methods due to its emphasis on autonomy and personal growth. By actively evaluating their teaching goals, classroom performance, student interactions, and the use of teaching resources, teachers can more clearly recognize their personal strengths and room for improvement in teaching (Panadero, 2017). In addition, self-assessment is not only a review of past teaching practices, but also a planning and promotion of future professional development. It emphasizes the importance of reflective learning, enabling teachers to achieve continuous improvement in actual teaching (Feng, 2006).

According to Seyyed (2010), the purpose of teacher self-assessment can be divided into two kinds: one is to ensure quality; the other is to promote professional learning, the former is a summative purpose, and the latter is a formative purpose. Wu (2004) believes that the very purpose of teacher assessment is to promote the development of teachers, and he should be developmental and oriented to the future of teachers. According to Fan (2004), teacher self-assessment methods encompass various approaches, including self-assessment forms, written reports, video recordings, role model observation, and feedback from external observers. Feng (2006) adopted teaching journals as a means of teacher self-assessment. He argued that teaching journals can record observations of emotions, attitudes, perceptions, reflections, designs, and many other relevant aspects of teaching.

Teacher professional development

Rao and Deng (2015) believe that reflection, cooperation, teaching and learning, research on education and teaching, and teacher evaluation play a crucial role in the process of teacher professional development. Teacher professional development can be achieved through participation in training, online learning, participation in academic groups and academic activities, educational tours and observations, and school-based teaching and training. Teacher professional growth is a combination of experience, reflection, and professional leadership, which involves mutual guidance and supportive cooperation among teachers.

Literature shows that scholars mainly think about teacher professional development at three levels: individual teacher, school and education system (Oddone, 2022). Individual-level professional development for teachers mainly consists of formulating plans, reflection, classroom observation and peer observation. School-level professional development for teachers includes establishing a good school culture, building a platform for teacher professional development in schools, forming school academic groups and carrying out academic activities. Professional development pathways for teachers within the education system include training on online platforms, training and further training

organized by the education administration, and so on. From the above literature review, pathways for teacher professional development fall into three main categories: training, collaboration and reflection.

Self-regulation learning and teacher professional development

Zimmerman's overview underscores the importance of self-regulation for teachers, asserting that self-assessment and reflection are key processes through which teachers can continuously improve their instructional quality (Zimmerman, 2019). Self-regulated learning not only supports individual teachers in refining their instructional practices but also equips them with the ability to adapt to evolving educational demands (Longhurst, 2021). By fostering goal setting, self-monitoring, and reflection, self-regulated learning enables teachers to identify areas for improvement in their teaching methods and actively work toward enhancing their professional competencies (Marlett, 2024). Teachers who employ self-regulation techniques tend to exhibit higher levels of adaptability and resilience, qualities essential for long-term professional growth in a dynamic educational environment (Philpott & Oates, 2018). Moreover, self-regulated learning creates opportunities for continuous skill enhancement by encouraging teachers to engage in lifelong learning practices (Longhurst, 2021). This aligns with the increasing emphasis on reflective teaching, which allows educators to critically analyze their own practices and make data-informed adjustments to improve both instructional effectiveness and student outcomes (Zimmerman, 2019). Consequently, self-regulated learning serves as a foundation for sustained professional development, ensuring that teachers remain responsive to the needs of diverse learning environments and are better equipped to meet the challenges of modern education (Davis, 2021). Self-regulated learning and teacher professional development share a symbiotic relationship, where self-regulation acts as both a catalyst and a sustaining force for teacher growth (Kitsantas, 2021). By incorporating self-regulation strategies into their professional development journey, teachers not only improve their instructional effectiveness but also cultivate a mindset of continuous improvement and adaptability, essential for thriving in the evolving educational landscape (Cypret-Mahach, 2018).

Self-assessment and teacher's professional development

Based on previous research, there appears to be a significant correlation between self-assessment and teacher professional development. Boog (2019) argued that self-assessment promotes transformative learning experiences and utilizes peer support, suggesting that engaging in self-assessment fosters reflective practice and promotes teacher growth. Liu and Qi (2021) emphasized that self-assessment significantly increased Chinese teacher confidence in their teaching competence and professional skills, suggesting that self-assessment has a positive impact on teacher development. Darling-Hammond et al. (2017) identified self-assessment as a key component of effective teacher professional development programs. Similarly, Panadero and Alonso-Tapia (2014) highlighted that self-assessment not only aids in identifying areas for instructional improvement but also enhances teacher capacity to set and achieve professional goals through structured reflection.

Harris and Brown (2018) conducted a longitudinal study in which teachers who engaged in structured self-assessment reported improvements in their instructional strategies and classroom management skills. The study demonstrated that self-assessment encouraged teachers to critically analyze their performance and take actionable steps toward addressing gaps in their teaching practice. In a quantitative study by Koster et al. (2012), a self-assessment framework was implemented among pre-service teachers. The study concluded that self-assessment tools were instrumental in fostering a deeper understanding of teaching practices, ultimately contributing to better-prepared educators. Moreover, research conducted by Zhang and Li (2020) in Chinese secondary schools revealed that integrating self-assessment practices into professional development programs led to measurable

improvements in teacher ability to differentiate instruction and respond to student needs.

The mediating effect of self-regulated learning

Several studies have underscored the mediator function of self-regulated learning (SRL) across various learning contexts. For instance, Cypret-Mahach (2018) demonstrated that SRL intervenes between teacher self-reflection and professional development by enabling teachers to develop specific strategies for instructional improvement from self-assessment findings. Similarly, Kitsantas et al. (2018) noted that SRL not only enhances teaching quality but also enhances the culture of continuous improvement and therefore is an essential mechanism for professional development.

The mediating effect of SRL is further supported by theoretical frameworks such as social cognitive theory (Bandura, 1986) and self-determination theory (Deci & Ryan, 1985). Philpott and Oates (2018) integrated these perspectives, showing that SRL mediates the impact of intrinsic motivation, often triggered by self-assessment, on professional competence. Their findings reveal that teachers who actively regulate their learning processes demonstrate higher adaptability and resilience in addressing classroom challenges. Moreover, Panadero and Alonso-Tapia (2014) highlighted SRL's structured processes, such as goal-setting and metacognitive monitoring, which amplify the benefits of self-assessment and ensure alignment with professional objectives. In the Chinese educational context, Zhang and Li (2020) emphasized SRL's unique mediating effect in collectivist cultures, where it fosters collaboration and mutual growth among teachers. Their findings contrast with Western studies, which often frame SRL as an individualistic process. The research demonstrates that SRL not only supports personal reflection but also enhances team-based professional development practices, aligning with China's focus on collective improvement and teacher learning communities. Therefore, research model shown in Figure 1 is provided based on previous studies.

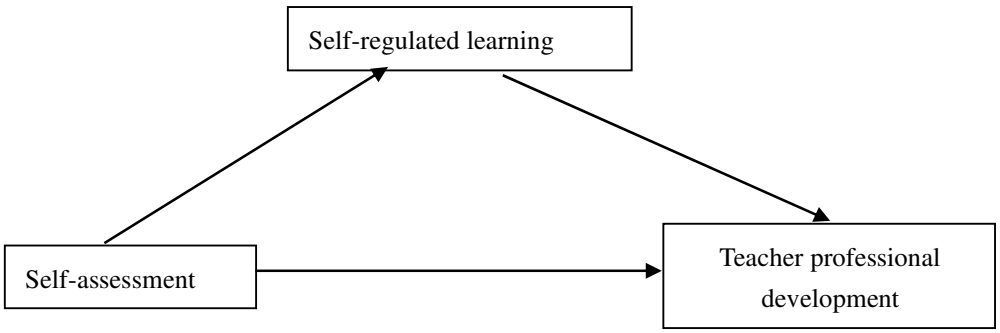


Fig 1. Conceptual framework

Research hypothesis

1. There is a significant relationship between self-regulated learning and teacher professional development among Chinese junior high school teachers.
2. There is a significant relationship between self-assessment and teacher professional development among Chinese junior high school teachers.
3. Self-regulated learning does mediate between self-assessment and teacher professional development among Chinese junior high school teachers.

Methodology

Research design and population

This research was conducted based on quantitative research. Quantitative research involves systematic collection and analysis of quantitative data to reveal some of the relationships and associations (Field,

2013). It aims to quantify and measure variables to generate objective and statistically sound outcomes. Correlational research design has been used for this research. Using a correlational design, researchers can study naturally occurring variables without the need for intervention, preserving the integrity of the educational setting (Curtis et al, 2016). Correlational research is a research design where the relation between variables is measured without manipulation. Finding a correlation between two or more variables is the aim of correlational research but does not indicate that one variable affects the other (Espinosa, 2015; Shanmugam & Hidayat, 2022).

The study population was junior high school teachers in China. According to the Ministry of Education of China's domestic education statistics, the total number of junior high school teachers in China is 2,699,208 (Ministry of Education of China). According to Cohen guidelines, 384 participants were selected for the study to analyze whether self-regulated learning and self-assessment influenced teacher professional development. The participants were junior high school teachers of all subjects in China. The broad distribution was designed to ensure that junior high school teachers from various subject areas were represented in the study across junior high schools in China, making the findings more relevant and applicable to all subject areas in junior high education in China.

Instruments

The questionnaire of this study consists of four main parts, the first part is the basic information of Chinese junior high school teachers, the second part is self-regulated learning scale, the third part is self-assessment scale, and the fourth part is teacher professional development scale. Respondents were required to rate each question on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

The basic information in Part 1 includes demographic questions. Five parts of the participants' gender, years of teaching experience, academic qualifications, teacher title and subjects taught will be collected. The second part of the self-regulated learning scale. The Motivation Strategies for Learning Questionnaire (MSLQ), created by Pintrich et al. (1991) and the Web-based Self-Regulated Learning Questionnaire developed by Hong Min-Ling of Taiwan (2017) were selected as the main references for measuring self-regulated learning abilities. The researcher adapted some of the questions to design a self-regulated learning questionnaire more suitable for Chinese teachers. An example of the questions was "I actively seek help from colleagues and experts when learning". The self-regulated learning questionnaire was finally designed in terms of learning self-efficacy (LSE) (5 items), learning motivation (LM) (5 items) and learning strategies (LS) (5 items). Learning self-efficacy examines teacher confidence in their own success in learning; learning motivation examines teachers internal and external motivation for learning; and learning strategies examine teacher existing learning strategies. The questionnaire has three subcomponents and 15 items. Examples of each subcomponent, "*I am confident in my ability to learn.*" "*I think learning can improve the quality of my teaching.*" "*I make a detailed study plan before I study.*"

The self-assessment scale was adapted from the Teacher Self-Assessment Questionnaire by Luo Huan (2008). The adapted teacher self-assessment questionnaire is more simplified and refined and can more accurately measure the self-assessment level of Chinese junior high school teachers. First, the adapted questionnaire deleted some more detailed items (such as "participating in the layout of classroom space"). At the same time, relevant items were merged. For example, the original questionnaire's 28th item "*Respect students' opinions, skills and experience*" and 30th item "*Encourage students to express their own views or opinions*" were merged into "*I will respect students' different opinions, skills and experience*" in the second questionnaire. Secondly, the adapted questionnaire

deleted some items that are not commonly used by junior high school teachers (such as “using the campus environment to support activities”) and focused more on abilities directly related to teaching. Finally, the adapted questionnaire has fewer and more refined items, which reduces the burden of evaluation and increases the enthusiasm of teachers to complete the questionnaire. A total of five subcomponents are teaching objectives (TO) (2 items), classroom teaching (CT) (4 items), self-improvement (SI) (3 items), teacher-student interaction (TSI) (4 items) and resource utilization (RU) (3 items), consisting of 16 items. Examples of each item “*I have clear teaching objectives.*” “*I will teach students according to their abilities.*” “*I will identify areas for improvement.*” “*I can communicate with students clearly and accurately.*” “*I can apply modern information technology in the teaching process.*”

The fourth part of the “China Junior High School Teacher Professional Development Scale” was adopted from the “Teacher Professional Development Scale” developed by Tang (2013) with reference to the “Junior High School Teacher Professional Standards” in China. This part of the questionnaire consisted of three parts: teacher professional philosophy and teacher ethics (PPTE) (4 items), teacher professional knowledge (PK) (3 items) and teacher professional competence (PC) (7 items), consisting of 14 items. Examples of each item “*I am able to treat each student fairly and respect their diversity.*” “*I have mastered the basic principles of education and teaching methods.*” “*I am able to design sound instructional programs based on instructional objectives and student characteristics.*”

Data analysis

The researcher applied Statistical Package for the Social Sciences (SPSS) version 27 and Smart PLS in conducting statistical analysis that was required. Descriptive analysis (mean and standard deviation), inferential analysis (Pearson Correlation) and mediating effect analysis (SEM) were employed in providing response to research questions and research objectives of the study. The mean scores and standard deviations will be contrasted for teacher professional development, self-regulated learning, and self-assessment scales to identify the overall extent and dispersion. Pearson correlation analysis was used to ascertain the correlation of teacher professional development with self-regulated learning and to identify the correlation of teacher professional development with self-assessment. Smart PLS was used to examine the mediating roles of self-regulated learning in teacher self-assessment and teacher professional development. Smart PLS was initially used to examine the reliability and validity of measurement model in this study. The tests of reliability were carried out using Cronbach's Alpha and overall reliability (CR). The tests of validity in this research were divided into discriminant validity and convergent validity tests. Heterotrait-Monotrait (HTMT) ratio of correlations and Fornell-Larcker criterion were utilized to verify the discriminant validity of the model. Average variance extracted (AVE) and outer loadings of all the items were utilized to verify the convergent validity of the model. Secondly, the structural model was verified. This study used a bootstrap resampling technique with 5000 replications and 392 samples to test the significance of the path coefficients (Hair et al., 2017). The t-test values were used to ascertain that the hypothesized paths in the model were significant.

Results

Respondent profile

392 questionnaires were collected, female teachers accounted for 70.4%, while male teachers accounted for 29.6%. The teaching experience of 1-3 years (22.4%), 4-6 years (22.2%) and 7-18 years (36.7%) is relatively large, accounting for nearly 80%, indicating that most teachers are relatively young. The proportion of teachers with bachelor’s degrees in the survey was the highest, accounting for 73.5%, followed by masters (11%) and vocational (9.9%), and teachers with doctoral degrees accounted for only 5.6%. The proportion of teachers with intermediate titles is the highest, accounting

for 66.3%, while teachers with junior titles account for 33.4%, and teachers with senior titles account for only 0.3%. In terms of subjects taught, Language (21.7%), English (24.2%) and mathematics (12.5%) teachers account for a large proportion, and these courses have a more significant core position in junior high school teaching.

Descriptive results

The descriptive results for self-regulated learning, self-assessment and teacher professional development are shown in Table 1. Descriptive analysis in this study included skewness, kurtosis, mean values, and standard deviation.

Table 1 Descriptive results

Constructs	Skewness	Kurtosis	Mean	Standard deviation
SRL	-.944	-.850	3.717	1.011
SA	-.561	-.753	3.109	1.010
TPD	-.524	-.713	3.128	0.988

Note: SRL: Self-regulated Learning; SA: Self-assessment; TPD: Teacher Professional Development

The data presented in Table 1 indicates that Chinese junior high school teachers demonstrated moderate in self-regulated learning, self-assessment and teacher professional development, with mean scores of 3.717, 3.109, and 3.128, respectively. The skewness values ranged from -0.944 to -0.524, falling within the acceptable range of ±2.0, while the kurtosis values ranged from -0.850 to -0.713, also within ±2.0. Notably, none of the values exceeded the cutoff score for any of the four sub-constructs, suggesting a normal distribution (Kline, 2005; Tabachnick et al., 2013).

Pearson correlation

Table 2 Pearson correlation

	SRL	**SA**
TPD	0.846**	0.787**

*Note: ** $p < 0.01$*

Table 2 indicates a significant relationship between self-regulated learning (SRL) and teacher professional development (TPD), with a correlation value of r=0.864 and sig=0.000 ($p<0.01$) and a significant relationship between self-assessment (SA) and teacher professional development (TPD), with a correlation value of r=0.787 and sig=0.000 ($p<0.01$). The data analysis results show that the relationship between SRL and TPD and the relationship between SA and TPD is strong. This finding accepts the hypothesis (H1 & H2) that "there is a significant relationship between self-regulated learning and teacher professional development among Chinese junior high school teacher." And "there is a significant relationship between self-assessment and teacher professional development among Chinese junior high school teacher."

Measurement model assessment

Reliability tests were used to check the stability and consistency of the scale (Guédon et al, 2003). Hair et al. (2017) mentioned that Cronbach's Alpha greater than 0.7 confirmed the scale's reliability. Composite reliability (CR) greater than 0.70 is satisfactory (Hair et al, 2017). As shown in Table 3, Cronbach's Alpha for all the variables was more than 0.90, which indicated that all the structures had high internal consistency. The values of CR were also greater than 0.9, which also assured high measurement model reliability.

Table 3 Reliability of model

Construct	**Cronbach's Alpha**	**Composite Reliability (CR)**
SRL	0.960	0.960

SA	0.961	0.962
TPD	0.939	0.942

Note: SRL: Self-regulated Learning; SA: Self-assessment; TPD: Teacher Professional Development

Fornell and Larcker (1981) described that AVE greater than 0.5 indicates the model has sufficient convergent validity. Hair et al (2017) say that outer loadings should be greater than 0.70 to have sufficient reliability. All variables in Table 4 indicate an AVE greater than 0.6, which again confirms that the model has high convergent validity. In addition, outer loadings for all the items are greater than 0.7, i.e., all the measurement items have high explanatory power to the latent variable, further testifying to convergent validity, as indicated in Figure 2.

Table 4 Convergent validity

Construct	Sub-construct	Outer loading	Average Variance Extracted (AVE)
SRL	Learning self-efficacy	0.964	0.648
	Learning motivation	0.959	
	Learning strategies	0.963	
SA	Teaching objectives	0.889	0.647
	Classroom teaching	0.945	
	Self-improvement	0.933	
	Teacher-student interaction	0.941	
	Resource utilization	0.941	
TPB	Professional philosophy and teacher ethics	0.948	0.609
	Professional knowledge	0.925	
	Professional competencies	0.960	

Note: SRL: Self-regulated Learning; SA: Self-assessment; TPD: Teacher Professional Development

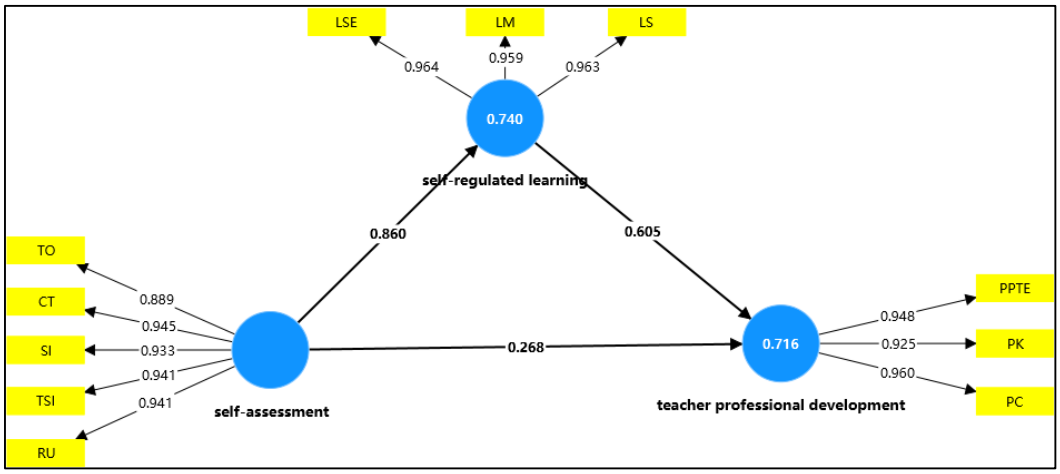


Fig 2. Structural model

If the HTMT value is less than 0.9 (Henseler et al., 2015), it indicates that the variables have good discriminant validity. Discriminant validity is confirmed using the Fornell-Larcker criterion when the square root of the Average Variance Extracted (AVE) for each latent construct is greater than its correlations with any other construct in the model (Fornell & Larcker, 1981). Table 5 shows that the HTMT values of all variables are less than 0.9, indicating that the discriminant validity of the model is good and all Fornell-Larcker criterion values satisfy the established standards.

Table 5 Discriminant validity

Heterotrait-Monotrait ratio (HTMT)			
Construct	SRL	SA	TPD

SRL			
SA	0.896		
TPD	0.878	0.829	

Fornell-Larcker criterion

Construct	SRL	SA	TPD
SRL	**0.930**		
SA	0.860	**0.962**	
TPD	0.788	0.835	**0.944**

Structural model assessment

This study applied a bootstrap resampling approach of 5000 replicates and 392 samples to assess the significance of path coefficients (Hair et al., 2017). Significances of the model hypothesized paths were confirmed by t-test values, and the findings are presented in Table 6 and Figure 2. The results point to self-assessment (SA) being significantly related to self-regulated learning (SRL) [$\beta = 0.860$, $t=28.361$, $p < 0.01$, 95% CI (0.795 ~ 0.914)], indicating that indeed self-assessment can enhance the level of self-regulated learning. In addition, self-assessment (SA) has a direct significant positive effect on teacher professional development (TPD) [$\beta = 0.268$, $t=2.742$, $p < 0.01$, 95% CI (0.101 ~ 0.483)]. At the same time, self-regulated learning (SRL) also has an important positive effect on teacher professional development (TPD) [$\beta = 0.605$, $t=6.476$, $p < 0.01$, 95% CI (0.398 ~ 0.759)].

Table 6 Path Coefficients

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics**	**CI**		**P value**
					Lower	**Upper**	
SRL→TPD	0.605	0.598	0.093	6.476	0.398	0.759	0.000
SA→SRL	0.860	0.860	0.030	28.361	0.795	0.914	0.000
SA→TPD	0.268	0.275	0.098	2.742	0.101	0.483	0.006

Note: SRL: Self-regulated Learning; SA: Self-assessment; TPD: Teacher Professional Development

To further test the mediation effect, this study used the mediation effect analysis process suggested by Hair et al. (2017), and the result is presented in Table 7. The path SA→SRL→TPD has a significant indirect effect [$\beta = 0.520$, $t=6.948$, $p < 0.01$, 95% CI (0.353 ~ 0.646)], suggesting that self-regulated learning mediates the effect between self-assessment and teacher professional development. However, since the direct effect of self-assessment on teacher professional development remained even after the control for [$\beta = 0.268$, $t=2.742$, $p < 0.01$, 95% CI (0.101 ~ 0.483)], the mediation effect was described as partial. Therefore, the above results verify that not only can self-assessment directly increase teacher professional development, but also indirectly affect teacher professional development through improved self-regulated learning. This result supports the hypothesis (H3) that "Self-regulated learning does mediate between self-assessment and teacher professional development among Chinese junior high school teachers."

Table 7 Indirect path coefficients

	Original sample (O)	**Sample mean (M)**	**Standard deviation STDEV**	**T statistics**	**CI**		**P value**
					Lower	**Upper**	
SA→SRL→TPD	0.520	0.513	0.075	6.948	0.353	0.646	0.000

Discussion

The findings of the study showed a significant positive correlation between professional development of teachers and self-regulated learning that confirms findings of existing research. For example, Zimmerman (2019) claimed that self-regulated learning helps teachers to continuously improve their teaching practices through goal setting, monitoring, and reflection. This outcome is consistent with the findings of Bai and Wang (2021), who emphasized that teacher instructional effectiveness and

professional happiness might be greatly boosted by self-regulated learning approaches, in addition to teacher capability in addressing professional challenges. Two main reasons can account for why self-regulated learning has positive impacts on teacher professional growth. Perception is one possible reason. First, the best approach to developing effective self-regulated learning ability is to accumulate successful experience from the past successful experience of the teacher. That is, effective self-regulating teachers are usually confident in teaching and learning ability, have a higher probability of engaging actively in professional learning undertakings and establishing clear goals in professional development.

Research shows that self-regulated learning helps improve teacher teaching standards and professional skills (Li, 2024). Second, teaching self-regulated learning may also be positively influenced by role models and peers. According to Bandura (1977), observing the successful experiences of others can enhance an individual's self-efficacy. Within the teacher community, this indirect experience may take the form of participating in peer exchanges, observing the classrooms of outstanding teachers, and actively participating in professional learning communities (Vrieling et al., 2013). These activities not only promote teacher professional growth, but also increase their emphasis on self-regulated learning, thereby promoting teacher continued development. Another fundamental reason lies in the environmental context. Research shows that an educational environment that supports autonomous learning and reflection can effectively promote teacher professional growth (Negara et al., 2021). In China's education system, the emphasis on teacher lifelong learning and the promotion of various teacher training programs in recent years have provided teachers with more opportunities to develop self-regulated learning abilities. These training programs help teachers improve their self-regulated learning by setting clear learning goals, providing continuous feedback, and creating an atmosphere of collaborative learning (Wei et al., 2009). However, although this study demonstrated a significant positive relationship between self-regulated learning and teacher professional development, this result may vary due to sample differences. For example, differences in educational resources, cultural backgrounds, and school support among teachers in different regions may lead to variations in research results. In addition, teacher age, teaching experience, and subject background may also have an impact on this relationship. Therefore, in future research, it is necessary to further explore the specific mechanism of self-regulated learning on professional development among different groups of teachers.

The research results found that Chinese junior high school teachers, there is a significant positive correlation between self-assessment and teacher professional development. The research results are consistent with the conclusions of existing research. Boog (2019) proposed that self-assessment can help teachers identify their own strengths and weaknesses through reflective practice, thereby promoting professional growth. Korthagen (2020) further emphasized that self-assessment is an important means to promote teacher continuous improvement, and its core lies in improving teacher professional confidence and professional abilities through reflective practice. A longitudinal study by Harris and Brown (2018) showed that teachers not only improved their teaching strategies but also significantly improved their classroom management abilities through structured self-assessment. Consistent with this, Chinese teachers can more clearly realize the deficiencies in the teaching process during the self-assessment process and adjust teaching methods by analyzing student learning outcomes. In addition, Zhang and Li's (2020) study showed that by integrating self-assessment practices into professional development programs, Chinese teachers could more effectively differentiate their teaching to meet the diverse students. Self-assessment is not only an important tool

for individual teacher growth, but also a key strategy to promote overall teaching quality improvement.

Through an empirical analysis of teachers in the Chinese context, this study further verifies the positive role of self-assessment in improving teaching capabilities and professional development, and at the same time provides a theoretical basis for optimizing self-assessment practice. Self-assessment prompts teachers to continuously reflect and adjust teaching methods during the teaching process, thereby optimizing classroom teaching effects (Wahyuni, 2021). By regularly evaluating teaching objectives, classroom management, and student feedback, teachers can discover their own shortcomings, clarify the direction of improvement, and make corresponding adjustments in the next step of teaching. This process of continuous improvement helps teachers continue to improve in their professional development and improve their teaching standards. In addition, self-assessment enables teachers to be more sensitive to student needs and adjust teaching pace and content to better meet students' individual differences (Wei & Cui, 2019).

Self-assessment in teacher professional growth is also reflected in multi-dimensional teaching reflection (Hossain, 2021). When teachers evaluate their own teaching performance, they can comprehensively analyze problems and successes in the classroom, thereby avoiding repeated mistakes in future teaching. Collaborative assessment and communication among teachers can bring more external perspectives and feedback, help teachers expand their thinking and improve their professionalism. In addition, participating in teaching assessments, writing teaching reflection logs and educational research papers are also important ways for teachers to promote professional development through self-assessment. In the Chinese education context, teacher professional development not only relies on external training and guidance but also requires teacher personal initiative and self-drive. The emphasis in traditional culture on "cultivating oneself to calm others" makes teacher pay more attention to self-reflection and self-improvement (Li, 2012). Through self-assessment, teachers can gain a deeper understanding of students' learning needs and improve teaching quality by adjusting teaching strategies. China's education system focuses on teacher lifelong learning and continuous growth. By establishing a teacher learning community, schools encourage teachers to conduct regular self-assessment and peer review, thereby improving the teaching level of the entire teacher team. Therefore, this study not only examines the relationship between self-assessment and teacher overall professional development but also explores the impact on teacher professional development from multiple dimensions of self-assessment (teaching goal setting, classroom teaching, practice improvement, resource utilization, and teacher-student interaction). This multidimensional analysis provides more detailed and comprehensive guidance for intervention strategies for teacher professional development.

This study's findings align with and support previous research, which has consistently highlighted the mediating role of SRL in professional development contexts. For instance, Cypret-Mahach (2018) demonstrated that SRL bridges self-reflection and professional development by converting insights into actionable strategies. Kitsantas et al. (2018) similarly emphasized that SRL fosters a culture of continuous improvement, making it a critical component of teaching efficacy. Furthermore, the structured processes of SRL outlined by Panadero and Alonso-Tapia (2014), such as goal-setting and metacognitive monitoring, were observed in this study as essential mechanisms by which self-assessment translates into professional growth. The consistency with prior findings can be attributed to the universal nature of SRL as a framework for reflective and adaptive learning. However, this study also highlights the unique cultural and systemic factors present in the Chinese education system, such as the emphasis on collectivism and teacher learning communities (Zhang & Li, 2020). These contextual nuances underscore how SRL not only facilitates individual growth but also fosters

collaboration and mutual improvement among educators, extending the applicability of prior research to new cultural settings. Self-assessment alone is not enough to achieve comprehensive professional development of teachers. Teachers need to transform the evaluation results into concrete practical actions through self-regulated learning strategies. According to the social cognitive theory proposed by Bandura (1986), self-regulated learning includes goal setting, learning plan formulation, process monitoring, and result reflection. These strategies not only help teachers cope with complex problems in teaching but also find a balance between teaching goals and classroom needs (Zimmerman, 2011).

Through self-regulated learning, teachers can manage their learning and work more effectively. For example, if teachers find out by themselves that they need to improve their classroom management by self-reflection, self-regulated learning strategies can help them develop improvement plans, for example, undergoing corresponding training and discussing teaching methods with colleagues. Research has also established that educators with higher levels of self-regulated learning abilities are more likely to take an active role in professional development activities and have higher motivation for pedagogical improvement and professional development (Hossain, 2021). In addition, self-regulated learning can contribute to teachers adjusting earlier on when faced with pedagogical challenges. For example, repeated process of checking and self-reflection in the self-regulation process can not only help the teachers identify and solve some issues in teaching but also can help them maintain flexibility and inventiveness in the changing education background (Zimmerman, 2011). The results in this study are also a good supplement to previous evidence about the relationship between teacher professional development and self-assessment, self-regulated learning.

Conclusion and implications

This study focuses on the relationship between self-regulated learning, self-assessment and professional development of Chinese junior high school teachers. Although existing research has extensively explored the relationship between self-regulated learning and self-assessment in different contexts, research that incorporates these factors into the framework of teacher professional development remains limited, especially in China. The overall objective of this study was to examine the correlation between self-regulated learning, self-assessment and teacher professional development at the junior high school level in China and the mediating effect of self-regulated learning on the relationship between self-assessment and professional development. This study adopted a quantitative approach, and data was collected through a validated questionnaire. A correlational research design was used to analyze the relationship between variables, and a SEM was used to analyze the mediating effect of self-regulated learning. The results of this study provide empirical evidence to support the positive effects of self-regulated learning and self-assessment on teacher professional development, and the importance of self-regulated learning as a mediator in the relationship between self-assessment and teacher professional development. These results highlight the importance of cultivating educators' self-regulated learning and self-assessment skills to promote their professional growth and teaching effectiveness.

The study found that self-regulated learning significantly affects teacher professional development. It is therefore crucial to design strategies to improve teacher ability to regulate learning. Schools and training providers should provide professional development programs that focus on goal setting, reflective practice and progress monitoring. Secondly, self-assessment has a direct and significant positive impact on teacher professional development. This highlights the need for schools to integrate self-assessment practices into teacher daily professional activities. Teachers should be encouraged to regularly evaluate their teaching goals, classroom management strategies, and student feedback. Third,

the mediating effect of self-regulated learning in the relationship between self-assessment and professional development suggests that training programs should not only focus on reflection but also provide an operational framework for implementing the results of reflection. For example, teachers who identify gaps in their teaching practice through self-assessment should be supported to develop plans for improvement using self-regulation strategies. Finally, the study highlights the need to tailor interventions to meet the different needs of teachers in different contexts. Different factors should be considered when designing professional development programs. Schools in resource-rich areas may focus on advanced technology tools and specialized training, while schools in resource-constrained areas should prioritize basic training programs and peer-supported learning. Therefore, create inclusive teacher communities that address individual differences to promote collective professional growth.

Limitations and recommendations

While the findings provide insightful information on such relationships, some limitations exist which warrant attention, and they leave room for future research opportunities. To begin with, the current study employed a cross-sectional study design, thus ruling out causal relationships between self-regulated learning, self-assessment, and teacher professional development. Future research should employ a longitudinal study design to examine the dynamics of changes in these relationships over time. For example, longitudinal follow-up of teachers at different stages of their career would inform us about the dynamic character of self-regulated learning and self-assessment as they facilitate professional growth. Second, the sample in this research was just Chinese junior high school teachers, and that may limit generalizability. Cultural, institutional, and policy differences may affect the impact of self-regulated learning and self-assessment in professional development. Cross-regional or cross-country comparative research could identify contextual factors moderating such associations. As an example, comparisons of professional development of teachers across collectivist versus individualistic societies could explain very much why and how self-directed learning and self-assessment are conceptualized and practiced (Bandura, 1986).

Third, the study focused only on self-regulated learning as a mediating variable but did not explore other potential mediating or moderating variables. Future research should examine other mediating factors, such as emotional intelligence, teacher efficacy, or peer support, to gain a more comprehensive understanding of the factors that influence teacher professional development. Exploring moderating factors such as teaching experience, subject specialization, or access to professional learning resources could also provide a nuanced understanding of how different factors interact (Zimmerman, 2011; Korthagen, 2020). Fourth, despite the increasing importance of digital tools in modern education, this study did not explore their impact on self-regulated learning and self-assessment. Future research could investigate how digital platforms and AI-driven tools influence teacher reflective practice and learning behaviors. For example, studying how technology supports self-assessment through real-time feedback or personalized learning pathways could provide practical insights into integrating technology into professional development programs (Harris et al., 2020). Finally, the findings of this study were limited to in-service teachers and did not consider teachers at different career stages. Future research could explore how different career stages are in self-regulated learning and self-assessment in different ways. For example, combining this study with Huberman's career stage theory could provide insights into how these processes evolve and what targeted interventions might support professional growth at each stage (Huberman, 1989).

Reference

Asterhan, C. S., & Lefstein, A. (2024). The search for evidence-based features of effective teacher

professional development: A critical analysis of the literature. *Professional development in education, 50*(1), 11-23. https://doi.org/10.1080/19415257.2023.2283437

Bai, H. R., & Wang, J. (2021). Self-regulated learning strategies and teacher professional development: a meta-analysis. *Educational Research Review*, *33*, 100393. https://doi.org/10.1016/j.edurev.2020.100393

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Boekaerts, M., & Minnaert, A. (1999). Self-regulation with respect to informal learning. *International Journal of Educational Research*, *31*(6), 533-544. https://doi.org/10.1016/S0883-0355(99)00020-8

Boog, B. W. M. (2019). "Self-assessment as a professional development strategy: transformative learning and the role of peer support." *Professional Development in Education*, *45*(4), 610-625. https://doi.org/10.1080/19415257.2018.1526819

Bransford, J. D. (1999). *How people learn: Brain, mind, experience, and school*. National Academy Press.

Cha, S. Y., (2021). the relation between regulatory emotional self-efficacy and academic adaptation of college students—the mediating effect of academic self-efficacy. *Advances in Psychology*, *11*(11), 2477–2485. https://doi.org/10.12677/ap.2021.1111283

Curtis, D., Dwyer, P., & Johnson, M. (2016). Using a correlational design to study naturally occurring variables in educational settings. *Educational Research Review*, *9*(2), 124–136. https://doi.org/10.1016/j.edurev.2016.02.001

Cypret-Mahach, J. (2018). Self-regulation and reflective teaching practices: The interplay in teacher growth. *Journal of Educational Research, 55*(4), 321-337. https://doi.org/10.1080/00131881.2018.1412007

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development.* Learning Policy Institute. https://doi.org/10.54300/122.311

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer Science.

Espinosa, A. (2015). Finding a correlation between variables in correlational research: Clarifying the misunderstanding. *Educational Research Methods*, *10*(3), 72–80. https://doi.org/10.1177/1475725714550572

Fan, Y. (2004). Teacher self-assessment methods. *Educational Psychology Review*, *16*(3), 145–160. https://doi.org/10.1007/s10648-004-1019-1

Feng, W. (2006). The use of teaching journals for teacher self-assessment. *Chinese Journal of Education Studies*, *24*(1), 25–37.

Field, A. (2013). *Discovering statistics using IBM SPSS Statistics*. https://doi.org/10.1111/j.2044-8317.1979.tb00840.x

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Gràcia, M., Alvarado, J. M., Vega, F., Jarque, M. J., Castillo, P., & Adam-Alcocer, A. L. (2025). A digital tool designed to support secondary education teachers' professional development and to develop students' oral language competence. *Computer Assisted Language Learning, 38*(3),

426-452. https://doi.org/10.1080/09588221.2023.2197963

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science*, *45*(5), 616–632. https://doi.org/10.1007/s11747-017-0517-x

Harris, L. R., & Brown, G.T. L. (2018). Using self-assessment to improve student learning. *Review of Educational Research*, *88*(4), 659-700. https://doi.org/10.3102/0034654318760672

Harris, L. R., & Brown, G. T. L. (2020). The complexity of teachers' conceptions of assessment: tensions between the needs of schools and students. *Assessment in Education: Principles, Policy & Practice*, *27*(6), 593-612. https://doi.org/10.1080/0969594X.2020.1778363

He, F. L. (2019). Physics teaching research on effectively improving teachers' professional development in the "6 choose 3" model under the tracking system. *Educational Research*, *2*(4). https://doi.org/10.32629/er.v2i4.1779

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hesterman, J. (2022). Developing lifelong, profound learning through continuous improvement. *Journal of Professional Learning*, *34*(2), 25-35. https://doi.org/10.1080/09585192.2022.669781

Hidayat, R., Qi, T. Y., Ariffin, P. N. B. T., Hadzri, M. H. B. M., Chin, L. M., Ning, J. L. X., & Nasir, N. (2024). Online game-based learning in mathematics education among Generation Z: A systematic review. *International Electronic Journal of Mathematics Education, 19*(1), em0763. https://doi.org/10.29333/iejme/14024

Hong, M. L. (2017). Web-based self-regulated learning questionnaire. *Taiwan Educational Research Journal*, *8*(2), 115–130.

Hossain, M. (2021). Self-assessment in teacher professional growth is also reflected in multi-dimensional teaching reflection. *International Journal of Instruction*, *14*(1), 1–16. https://doi.org/10.29333/iji.2021.1411a

Huberman, M. (1989). The professional life cycle of teachers. *Teachers College Record*, *91*(1), 31–57.

Jabar, J. M., Hidayat, R., Samat, N. A., Rohizan, M. F. H., Rosdin, N. A., Salim, N., & Norazhar, S. A. (2022). Augmented reality learning in mathematics education: A systematic literature review. *Journal of Higher Education Theory and Practice, 22*(15), 183-202. https://doi.org/10.33423/jhetp.v22i15.5570

Jiang X. H. (2020). On how college teachers can improve their professional ethics in education and teaching practice. *Modern Education Forum*, *3*(7), 127. https://doi.org/10.32629/mef.v3i7.2583

Jungsub Kim, KimWooRi, Shim Hyo Jin, & Kim Eunbin. (2019). Development of a collaborative learning consultation model to enhance students' self-regulated learning skills: Focused on elementary master teachers' roles. *Teacher Education Research*, *58*(1), 117–130. https://doi.org/10.15812/ter.58.1.201903.117

Kannadass, P., Hidayat, R., Siregar, P. S., & Husain, A. P. (2023). Relationship between computational and critical thinking towards modelling competency among pre-service mathematics teachers. *TEM Journal, 12*(3). 1370–1382. https://doi.org/10.18421/tem123-17

Kitsantas, A., Reiser, R. A., & Doster, J. (2018). Developing self-regulated learning skills: The important role of self-assessment. *Instructional Science, 46*(3), 441-462. https://doi.org/10.1007/s11251-017-9443-7

Kline, P. (2005). *Psychometrics and psychology: The state of the art*. Routledge.

Korthagen, Fred A. J. (2020). "Inconvenient truths about teacher learning: towards professional development 3.0." *Teachers and Teaching*, *26*(3), 268-284. https://doi.org/10.1080/13540602.2020.1730454

Li, J. (2024). *Teachers' self-regulated learning and knowledge development in an asynchronous online professional development program (Poster 15).* AERA 2024. https://doi.org/10.3102/ip.24.2105863

Li, X. (2012). Teachers' professional development from the perspective of teaching reflection. *Northwest Normal University* (*Social Sciences*), *49*(4), 61–65.

Li Z. C. (2020). An analysis of cultivating junior middle school students' reflective learning ability in mathematics. *International Education Forum*, *2*(5), 72. https://doi.org/10.32629/jief.v2i5.1406

Liu, S., & Qi, J. F. (2021). The impact of self-assessment on teacher development: a case study in China. *Asia-Pacific Journal of Teacher Education*, *49*(1), 69-83. https://doi.org/10.1080/1359866X.2020.1848157

Luo M. X, & Lin J. J. (2020). A literature review on the professional development of non-preschool education majors in rural China. *Educational Science Development*, *2*(3). https://doi.org/10.36012/sde.v2i3.1640

Mohd Saad, M. R., Mamat, S., Hidayat, R., & Othman, A. J. (2023). Integrating technology-based instruction and mathematical modelling for STEAM-based language learning: A sociocultural and self-determination theory perspective. *International Journal of Interactive Mobile Technologies (IJIM), 17*(14), 55–80. https://doi.org/10.3991/ijim.v17i14.39477

Negara, M., Suryani, N., & Sujana, I. K. (2021). Research trends and hotspots in the core competencies of Chinese students: A visualized analysis. *Education and Learning*, *15*(3), 345–360. https://doi.org/10.11591/edulearn.v15i3.2021

Oddone, K. (2022). The nature of teachers' professional learning through a personal learning network: Individual, social and digitally connected. *Teaching and Teacher Education: Leadership and Professional Development*, *1*, 100001. https://doi.org/10.1016/j.tatelp.2022.100001

OECD. (2020). *Adopting better criteria for better evaluation: Defining concepts and applying principles (Revised edition)*. https://doi.org/10.1787/29249e62-zh

Panadero, E., & Alonso-Tapia, J. (2014). How self-regulated learning mediates the relationship between self-assessment and learning outcomes. *Studies in Educational Evaluation, 43*(1), 1-19. https://doi.org/10.1016/j.stueduc.2013.11.003

Philpott, D., & Oates, T. (2018). Motivation and self-regulation in teacher professional development: A dual framework approach. *Educational Psychology Review, 30*(3), 567-589. https://doi.org/10.1007/s10648-018-9452-y

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*, 33-40.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). Motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement*, *51*(3), 803–819. https://doi.org/10.1177/0013164491513025

Rao, C. M., & Deng, T. (2015). Key elements in the process of teacher professional development. *Research in Educational Development*, *25*(4), 12-19.

Seyyed, M. (2010). The purpose of teacher self-assessment: Summative and formative purposes. *Educational Assessment*, *12*(3), 45–58. https://doi.org/10.1080/10624431003629560

Shanmugam, P., & Hidayat, R. (2022). Assessing grit and well-being of Malaysian ESL teachers. *Malaysian Journal of Learning and Instruction, 19*(2), 153-181. https://doi.org/10.32890/mjli2022.19.2.6

Shi J. G. (2018). Research on the application of big data technology in teaching. *Innovation and Practice of Teaching Methods*, *1*(1). https://doi.org/10.26549/jxffcxysj.v1i1.968

Sun H. B, & Cui Y. Q. (2020). Rural middle school teacher burnout and school management strategies. *International Education Forum*, *2*(4), 186. https://doi.org/10.32629/jief.v2i4.1305

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2013). *Using multivariate statistics (6th ed.)*. Pearson Education.

Vrieling, E., Brekelmans, M., & Wubbels, T. (2013). The role of the teacher in fostering self-regulated learning. *Learning and Instruction*, *26*, 1–9. https://doi.org/10.1016/j.learninstruc.2012.12.001

Wahyuni, S. (2021). Self-assessment prompts teachers to continuously reflect and adjust teaching methods during the teaching process, thereby optimizing classroom teaching effects. *Indonesian Journal of Halal Science and Technology*, *4*(1), 1–10.

Wei, X., & Cui, Y. (2019). Self-assessment enables teachers to be more sensitive to student needs and adjust teaching pace and content to better meet students' individual differences. *Journal of Education and Practice, 10*(12), 45–52.

Wei, X., Liu, X., & Li, H. (2009). Teacher professional development through self-regulated learning: A case study in China. *Teaching and Teacher Education*, *25*(2), 274–282. https://doi.org/10.1016/j.tate.2008.07.001

Wu, J. (2004). Rethinking the purpose of teacher evaluation. *Research in Higher Education of Engineering*, *2004*(06), 73-74.

Yang, L., & Lei, X. (2023). Junior high school artificial intelligence literacy: Connotation, evaluation, and promotion strategy. *Open Journal of Social Sciences*, *11*, 33–49. https://doi.org/10.4236/jss.2023.115004

Zhang, H., & Li, M. (2019). The relationship between junior high school teachers' professional development and teaching quality improvement. *Educational Research*, *49*(3), 95-102.

Zhang, Q., & Li, T. (2020). The impact of self-assessment and self-regulated learning on teacher collaboration in Chinese secondary schools. *China Journal of Education Studies, 15*(3), 55-72. https://doi.org/10.1016/j.cjes.2020.02.005

Zhu Y. F. (2019). A brief analysis of the factors and countermeasures of primary school teacher burnout. *Educational Research*, *2*(5). https://doi.org/10.32629/er.v2i5.1822

Zimmerman, B. J., & Schunk, D. H. (2011). *Motivational sources and outcomes of self-regulated learning and performance. In B. J. Zimmerman & D. H. Schunk (Eds.)*, Handbook of self-regulation of learning and performance (pp. 49-64).

Zimmerman, B. J. (2019). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64-70.