

Investigating Chinese In-service Teachers' Concerns About Teaching Thinking Using the Concern-Based Adoption Model (CBAM)

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Abstract

Teaching thinking has been the focus of the new round of key competencies-oriented K-12 education reform in China. Based on the Concerns-Based Adoption Model (CBAM), this study investigated Chinese in-service teachers' concerns about teaching thinking and how demographic variables affected their concerns. A questionnaire modified from the Stages of Concerns (SoC-TT) was used to collect the data. Altogether, 382 in-service teachers from 28 cities in China participated in this study by filling out the online questionnaire voluntarily and anonymously. The results showed that: (1) The modified seven-stage SoC-TT instrument showed satisfactory reliability and validity in the context of teaching thinking in China. (2) Teachers showed higher self-concerns (*Informational and Personal*) and impact concerns (*Consequence, Collaboration, and Refocusing*) while their task concerns (*Management*) about teaching thinking were relatively low. (3) Except for the *Consequence* stage, their demographic variables significantly influenced teachers' concerns at other stages. Implications for professional development for teaching thinking were discussed.

Keywords: teaching thinking, in-service teachers, CBAM, stages of concerns

1. Introduction

As the agents in educational reforms, teachers consistently play decisive roles throughout these processes (Fullan, 2007). Notably, teachers' attitudes, skills, and actions toward changes are recognised as critical variables in the design and implementation of these reforms (Datnow, 2020; Harris et al., 2017; Starkey et al., 2009; Ungar, 2016). Based on these diverse perspectives, teachers' responses to educational reforms may vary. Some teachers, who accept changes as great opportunities to make a positive impact, can enthusiastically embrace them. In contrast, others doubt their effectiveness and view them as threats to their current professions (Kwok, 2014). These reactions are often shaped by teachers' *concerns*, which are defined as the composite representation of feelings, perceptions, and thoughts about the changes they face (Hall et al., 1977). Therefore, addressing teachers' concerns is crucial for investigating how teachers manage and contribute to ongoing educational reforms.

In the past several decades, at the heart of the different positive changes in education worldwide, an emphasis on teaching thinking has gained significant attention in K-12 schools (Burke & Williams, 2008; Greiff et al., 2015; Long et al., 2021). Though teachers' capabilities of teaching thinking determine the efficiency and effectiveness of fostering students' higher-order thinking skills, only a few studies (Long et al., 2021; Zhao et al., 2019) have focused on teachers' professional development for teaching thinking. Therefore, uncovering teachers' concerns about teaching thinking is fundamental to designing and implementing professional development programmes for teaching thinking.

The *Concerns-Based Adoption Model* (CBAM), proposed by Hall et al. (1977), is a theoretical framework that measures, describes, and explains how teachers' concerns evolve while implementing new curricula or teaching practices. With the lens of the CBAM, this study aimed to investigate Chinese in-service teachers' concerns about teaching thinking. The study also tried to reveal how demographic variables (i.e., gender, age, education level, school level, school location, subject taught, teaching experience, and employment) influenced teachers' concerns about teaching thinking as an educational reform.

2. Literature review

2.1 *Teaching Thinking as an Educational Reform and Teachers' Concerns*

Cultivating students' higher-order thinking skills has gradually been put at the centre of educational reforms. For example, the Partnership for 21st Century Learning (2019) defined critical thinking as a 21st-century skill. Chinese recently released *Compulsory Education Curriculum Guidelines (2022 Edition)* (Ministry of Education of the People's Republic of China, 2022) explicitly outline domain-specific thinking skills for each subject as a response to the release of the *Chinese Students' Key Competencies* in 2016 (Key Competencies Research Group, 2016). Thus, teaching thinking is getting unprecedented attention and has become the focus of the new round of K-12 education reform in China.

Teaching thinking is a series of innovative approaches aiming to develop students' thinking abilities and help them process their knowledge (Long et al., 2021). To achieve this goal, various thinking skills interventions have emerged worldwide since the 1970s (Lipman, 1982; Novak & Gowin, 1984; Buzan & Buzan, 2006; Hyerle & Alper, 2011). Teaching thinking imposes new requirements on teachers' professional development. Effective professional development for teaching thinking should equip teachers with the necessary beliefs, knowledge, and skills about teaching thinking. To achieve this goal, teacher education institutes and researchers have developed various courses and implemented rich programs. As an example of these programs, Zhao et al. (2019) pioneered the *Alliance of Thinking Schools* and established a professional learning community dedicated to teaching thinking in K12 schools across China.

Even though many professional development projects for teaching thinking have been implemented (Long et al., 2021; Zhao et al., 2019; Zhao et al., 2023), few studies have examined teachers' concerns about teaching thinking and how teachers respond to it. The success of teaching thinking reforms depends on many factors, including teachers' beliefs and knowledge about teaching thinking, and their engagement in learning and practice of teaching thinking. Therefore, exploring teachers' concerns about teaching thinking is essential in designing and implementing professional development programs to help teachers bridge theory-practice and belief-action gaps (Long et al., 2021) during teaching thinking as educational reforms.

2.2 *The CBAM and the SoC*

Alongside the *Technology Acceptance Model* (TAM) and the *Diffusion of Innovation* (DOI), the CBAM stands among influential frameworks monitoring individuals' responses to changes in educational contexts. The TAM assumes that an individual's acceptance of a system is determined by perceived *usefulness* and *ease of use* (Davis, 1989), while The DOI provides a comprehensive theory on how innovations spread through communication channels within a social system (Rogers, 2003). Although the TAM and the DOI offer valuable insights, they predominantly approach teachers' adoption of changes from a static perspective. Likewise, they fail to capture the dynamic change processes teachers undergo. Therefore, in the context of new education reform, exploring teachers' concerns about changes and their progression through the SoC in the CBAM framework becomes imperative.

The CBAM is a theoretical framework designed to measure, describe, and explain teachers' concerns and the change process when new curricula and instructional practices are implemented (Hall et al., 1977). The CBAM is widely used to monitor and lead the educational change process and conduct change-related research (Fischer et al., 2019). Five basic assumptions about change were proposed in the CBAM: (a) change is a process, not an event; (b) change is done by individuals; (c) change is a very personal experience; (d) change involves developmental growth in skills and feelings; and (e) change can be enabled by interventions directed towards individuals, innovations, and contexts (Anderson, 1997). The CBAM consists of three dimensions, namely, *Stages of Concern* (SoC), *Levels of Use*, and *Innovation Configurations* (Hall & Hord, 1987). The SoC is about teachers' perceptions and feelings, the *Levels of Use* is about the implementation of an innovation, and the *Innovation Configurations* are about the various methods of implementing an innovation (Fig. 1) (Hall & Hord, 1987).

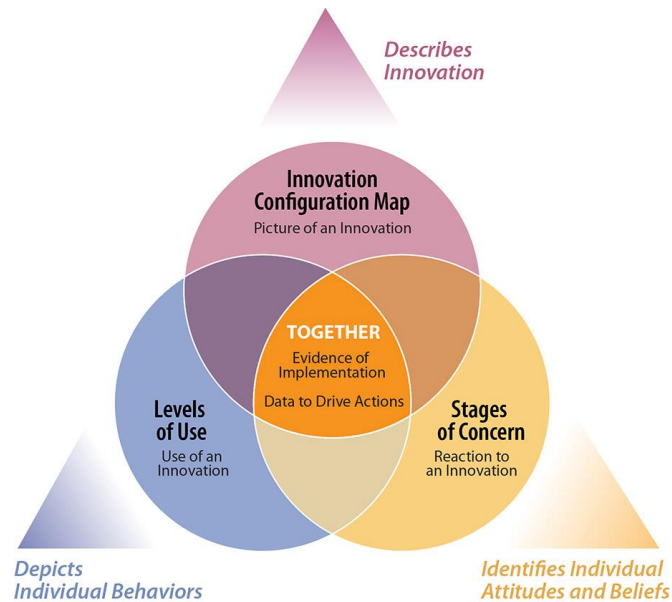


Figure 1. The three diagnostic dimensions of the CBAM (Hall & Hord, 1987)

Among the three dimensions, SoC represents a widely used theoretical framework for assessing teachers’ concerns during reforms, especially those related to curricular changes. SoC is most widely used because it addresses changes’ affective or personal aspects, which are arranged into *concerns* (Hall et al., 1977). SoC is a seven-stage model, which includes: *Awareness* (Stage 0), *Informational* (Stage 1), *Personal* (Stage 2), *Management* (Stage 3), *Consequence* (Stage 4), *Collaboration* (Stage 5), and *Refocusing* (Stage 6). These stages can be grouped into four parallel categories proposed by Fuller (1969): *unrelated concern* (*Awareness*), *self-concern* (*Informational* and *Personal*), *task concern* (*Management*), and *impact concern* (*Consequence*, *Collaboration*, and *Refocusing*) (Figure 2).

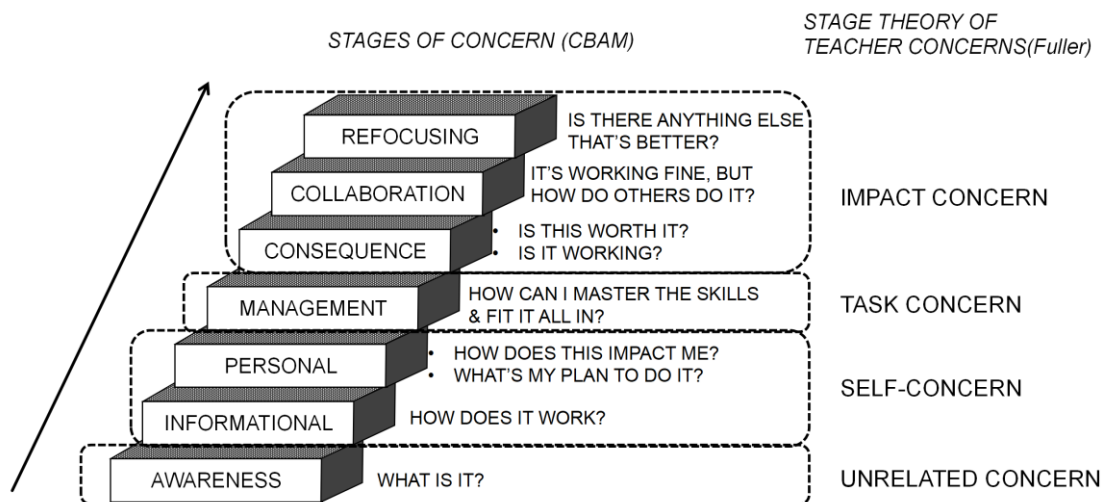


Figure 2. SoC and Fuller’s Stage Theory of Teacher Concern

2.3 The Measurement of SoC

Hall et al. (1977) developed a 35-item SoC questionnaire to measure the intensity of teachers' concerns at various stages. This SoC questionnaire stands as a crucial diagnostic tool. It has been widely used across diverse educational domains such as science education (Geng et al., 2019), inclusive education (Dörenb ächer-Ulrich et al., 2020a), distance education (Kayaduman & Demirel, 2019), and inquiry-based science curriculum (Makwinya et al., 2022). The SoC questionnaire demonstrated differentiated reliability and validity in assessing teachers' concerns in different world regions (Alnosiaan, 2018; de Vocht et al., 2017; Gasaymeh, 2017).

However, many studies noted that the SoC questionnaire was culturally sensitive and needed to be adjusted for different cultures and reforms (Cheung et al., 2001; Fischer et al., 2019; Kwok, 2014; Lau & Jong, 2022; Makwinya et al., 2022). Makwinya et al. (2022) validated that their data supported the original seven stages. Kwok (2014) found that six stages (except *Awareness*) can be extracted. Cheung et al. (2001) found that the five-stage model (*Awareness*, *Informational/Personal*, *Management*, *Consequence/Collaboration*, and *Refocusing*) fit their data best in the context of a large-scale reform of the English, Chinese, and mathematics curricula in Hong Kong.

Given the continuous emphasis on teaching thinking and its impact on teacher effectiveness and efficiency, there is a need to extend the application of the SoC questionnaire to this new scenario. Examining teachers' concerns about teaching thinking can provide valuable insights to help researchers and stakeholders make recent progress in key competencies-oriented K-12 education reform.

2.4 The Present Study

With the CBAM as the theoretical framework, this study aimed to disclose Chinese in-service teachers' concerns about teaching thinking. To accomplish this goal, we revised the SoC questionnaire to fit the context of teaching thinking (SoC-TT) in China and tested its reliability and validity. Given the effects of demographic variables (i.e., gender, age, education level, school level, school location, subject taught, teaching experience, and employment), this study also explored how these factors affected the levels of teachers' concerns about teaching thinking. The research questions were as follows:

RQ1: What were the SoC-TT's reliability and validity?

RQ2: What was Chinese in-service teachers' concerns about teaching thinking?

RQ3: How did demographic variables affect teachers' concerns about teaching thinking?

3. Method

3.1 Participants

Three hundred eighty-two in-service teachers from 28 cities in China participated in this study by filling out an online questionnaire anonymously and voluntarily, with 116 responses in March, 2021 and 266 responses in September, 2022. After excluding 17 invalid responses, 365 valid responses (females: 289, 79.18%; males: 76, 20.82%) remained. Participants had various education levels (associate or below: 15, 4.11%; bachelor: 277, 75.89%; masters: 72, 19.73%; Ph. Ds: 1, 0.27%) and teaching experiences (years<10: 179, 49.04%; 10≤ years<20: 66, 18.08%; 20≤ years<30: 96, 26.30%; years≥ 30, 24, 6.58%). More detailed demographic information about the participants is presented in Appendix Table A1.

3.2 Instruments Development

A questionnaire was developed to collect the participants' demographic data (gender, age, education level, school level, school location, subject taught, teaching experience, and employment). The 35-item SoC questionnaire by Hall et al. (1977) was translated into Chinese, modified to align with the teaching thinking context, and was used to investigate teachers' stages of concerns about teaching thinking. For example, "reform" was rephrased to "teaching thinking." Two graduate students majoring in educational technology committed to translation and five experts in the field of teaching thinking (a professor, two trainers, and two teachers with rich experience in teaching thinking) reviewed the questionnaire items to improve their clarity and content validity. The modified SoC questionnaire (SoC-TT) included 35 items using a five-point Likert scale, with "1" indicating "strongly disagree" and "5" indicating "strongly agree."

3.3 Data Analysis

SPSS 26.0 and AMOS 26.0 were used to analyse the data. First, confirmatory factor analysis (CFA) and correlation analysis were conducted to assess the validity of the latent variables. Cronbach's alphas (α) were calculated to determine the internal consistency of the scale in the instrument. Second, descriptive statistics drew

the overall picture of the participating teachers' concerns. Third, we conducted a regression analysis using each stage in the CBAM as the dependent variable. Demographic variables (gender, age, education level, school level, school location, subject taught, teaching experience, and employment) were used as predictors.

4. Results

4.1 Reliability and Validity of the SoC-TT

Previous studies have revealed four typical models: the seven-stage model (Model 1) with all seven stages (Hall et al., 1977), the six-stage model (Model 2), which removes *Awareness* (de Vocht et al., 2017), and the five-stage model (Model 3) which combines *Informational* with *Personal and Consequence* with *Collaboration* simultaneously (Berg, 1993). Therefore, a set of CFAs was conducted to find the most suitable model for this study. After removing two items (A2 and A5) from the SoC-TT questionnaire due to their failure to distinguish the participants in the high 27% and low 27% scoring groups (Appendix Table A2), CFA was used to validate the measurement model with the remaining 33 items. Results showed the seven-stage model shows the best indices with $\chi^2/df=2.304$, $p<0.001$, RMSEA=0.060, SRMR =0.057, CFI=0.949, TLI=0.942 (Table 1), which met the recommended criteria (Hu & Bentler, 1999). In the first round of CFA for the seven-stage model, I1 (factor loadings = 0.331) and P1 (factor loadings = 0.423) were removed according to the criteria suggested by Hair et al. (2010). Then, in the second-round CFA with 31 items, the standardised factor loadings of all items exceeded 0.50 (Figure 3).

Table 1. The goodness-of-fit of the four models in the confirmatory analyses

Model	χ^2	χ^2/df	RMSEA	SRMR	CFI	TLI
Model 1 (seven stages)	951.405(0.000)	2.304	0.060	0.057	0.949	0.942
Model 2 (six stages)	862.667(.000)	2.575	0.066	0.057	0.948	0.942
Model 3 (five stages)	2261.752(.000)	4.982	0.105	0.078	0.831	0.815
Recommended value	$p < 0.05$	< 3.0~4.0	< 0.08	< 0.08	≥ 0.90	≥ 0.90

Note. RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual; CFI = comparative fit index; TLI = Tucker-Lewis Index.

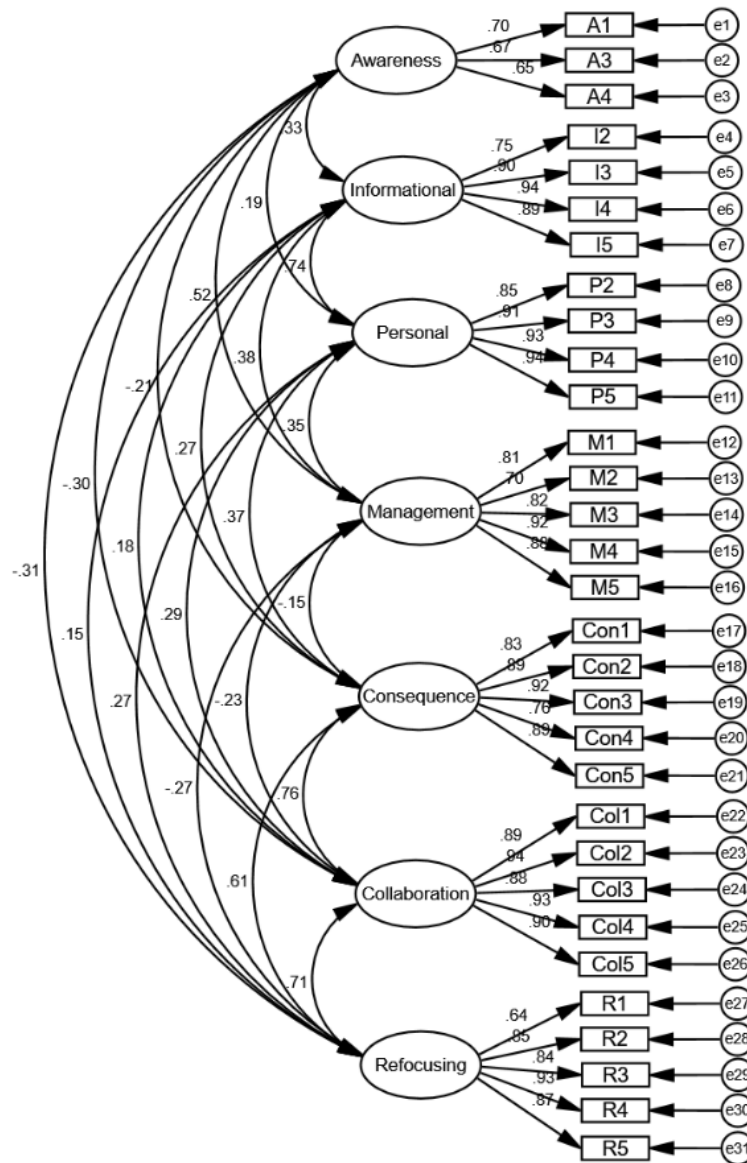


Figure 3. Results of the CFA

The reliability and validity of the instrument were examined by the following key indicators: internal consistency, convergent validity, discriminant validity, and the fitness of the seven-stage model. The factor loadings of the 31 items exceeded 0.50, and Cronbach’s alpha(α) coefficients of seven stages exceeded 0.70 (Appendix Table A2), demonstrating good internal consistency (Schumacker & Lomax, 2004). Except for *Awareness*, the values of composite reliability of the other six constructs exceeded 0.70, and the values of average variance extracted (AVE) all exceeded 0.50 (Appendix Table A2), indicating acceptable convergent validity (Fornell & Larcker, 1981). The square roots of the AVEs were all greater than the correlation coefficients with other constructs (Table 3), indicating adequate discriminant validity (Chin, 1998). Therefore, we affirmed that the revised SoC questionnaire is reliable and valid.

Table 3. Means, S.D., and correlations among the variables

	M	S.D.	0	1	2	3	4	5	6
0. Awareness	2.37	0.91	.670						
1. Informational	3.77	0.95	.319**	.871					
2. Personal	3.96	0.90	.178**	.696***	.906				
3. Management	3.19	1.15	.428**	.420***	.365***	.830			
4. Consequence	4.19	0.76	-.166**	.238***	.353***	-.118**	.858		
5. Collaboration	4.14	0.78	-.238**	.151**	.268***	-.204***	.720***	.906	
6. Refocusing	3.91	0.87	-.245**	.103*	.226***	-.234***	.551***	.665***	.833

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Bold type indicates the AVE square root.

4.2 Descriptive Statistics of Teachers' Concerns About Teaching Thinking

The means of teachers' concerns about teaching thinking at each stage were calculated and plotted (Table 3 and Figure 4). The sequence from high to low was as follows: *Consequence*, *Collaboration*, *Personal*, *Refocusing*, *Informational*, *Management*, and *Awareness*. The results indicated that teachers exhibited a certain level of concern across all stages, with the concern observed in the *Awareness* and *Management* stages notably lower than in other stages. As *Awareness* is the initial stage and is considered an *unrelated concern*, teachers' lowest concern at this stage showed that they had gone through this stage. Thus, we reported related data but did not discuss it in this article.

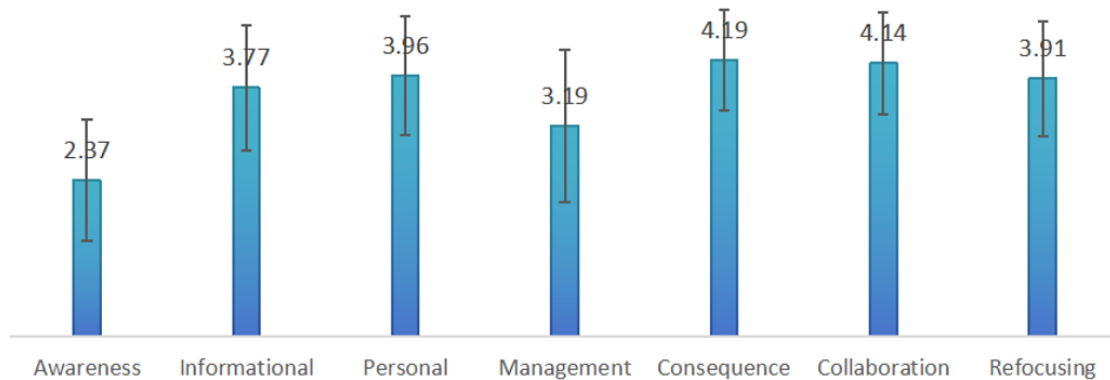


Figure 4. Profile of the Stage of Concern of 365 Teachers

The correlation analysis revealed significant associations between each pair of stages (Table 3). Among them, the positive correlation between *Consequence* and *Collaboration* was the highest ($r=0.720$, $p<0.001$), and the positive correlation between *Informational* and *Refocusing* was the lowest ($r=0.103$, $p<0.05$). In addition, *Management* was significantly negatively correlated with *Consequence* ($r=-0.118$, $p<0.01$), *Collaboration* ($r=-0.204$, $p<0.001$), and *Refocusing* ($r=-0.234$, $p<0.001$).

4.3 The Effects of Teachers' Demographic Variables on Their Concerns About Teaching Thinking

With teachers' concerns at each stage as the dependent variable and their demographic variables as independent variables, regression analysis was conducted individually. The results showed that some demographic variables

significantly predicted teachers' concerns at the *Informational*, *Personal*, *Management*, *Collaboration*, and *Refocusing* stages (Table 4).

Table 4. Coefficients table of the regression analysis

Dependent variable	R-Squared	F -value	p-Value
0. Awareness	0.115	5.5778	0.000***
1. Informational	0.072	3.438	0.001**
2. Personal	0.079	3.829	0.000***
3. Management	0.090	4.386	0.000***
4. Consequence	0.023	1.053	0.396
5. Collaboration	0.059	2.808	0.005**
6. Refocusing	0.053	2.475	0.013*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The detailed regression analysis results further disclosed the effect of demographic variables in predicting teachers' concerns at each stage (briefed in Table 5 and detailed in Appendix Table A3). Teachers' gender (Male = 0, Female = 1) was strongly related to the *Informational*, *Personal*, and *Management* stages. Female teachers showed higher concerns than male teachers at these three stages. Teachers' education level (Associate or below = 1, Bachelor = 2, Master = 3, Ph. D = 4) significantly predicted the *Refocusing* stage. With the improvement of education level, teachers will pay more attention to the *Refocusing* stage. The level of schools that teachers worked for (primary school = 1, middle school = 2, high school = 3) was a significant predictor of teachers' concerns at the *Informational*, *Personal*, and *Management* stages. High school teachers showed the highest concerns at these three stages, while primary school teachers had the lowest concerns. Teachers' working experience affected their concerns at the *Informational*, *Personal*, and *Collaboration* stages. Teachers with richer teaching experience have a higher concern at the stages of *Informational* and *Personal*, and lower concerns at the *Collaboration* stage. In addition, teachers' roles in their schools (Manager = 1, Teacher = 2) significantly predicted their concerns at the *Personal* stage. Managers showed higher concerns than teachers at this stage. However, teachers' age and school location did not predict their concerns at any stage.

Table 5. Briefed Regression results

Variables	B	SD	Beta	T	Sig
DV: <i>Awareness</i>					
IV:					
Education level	-0.263	0.103	-0.136	-2.552	0.011*
School level	0.271	0.075	0.220	3.610	0.000***
Subject	0.032	0.011	0.149	2.838	0.005**
Employment	0.256	0.116	0.140	2.205	0.028*
DV: <i>Informational</i>					
IV:					
Gender	0.350	0.140	0.150	2.510	0.013*
School level	0.208	0.080	0.162	2.598	0.010*
Teaching experience	-0.253	0.098	-0.267	-2.576	0.010*
DV: <i>Personal</i>					
IV:					
Gender	0.313	0.122	0.153	2.568	0.011*

School level	0.141	0.070	0.125	2.013	0.045*
Teaching experience	-0.251	0.086	-0.302	-2.931	0.004**
Employment (roles in the school)	-0.250	0.108	-0.149	-2.310	0.021*
DV: <i>Management</i>					
IV:					
Gender	0.400	0.141	0.167	2.825	0.005**
School level	0.271	0.081	0.206	3.336	0.001**
DV: <i>Collaboration</i>					
IV:					
Teaching experience	0.147	0.075	0.206	1.975	0.049*
DV: <i>Refocusing</i>					
IV:					
Education level	0.222	0.086	0.142	2.576	0.010*

Note. DV= Dependent Variable, IV=Independent Variable * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5. Discussion

In this study, the seven-stage SoC model with 31 items was supported and demonstrated satisfactory reliability and validity, completely insistent with the original structure proposed by Hall et al. (1977). This seven-stage model comprehensively addresses the various stages that teachers experienced, illustrating the applicability and effectiveness of the model in the context of Teaching Thinking in China.

5.1 Teachers' Higher Self-Concerns and Impact Concerns Versus Their Lower Task Concerns About Teaching Thinking

In the CBAM, individuals' concerns stages are an idealised sequential progression from stage 0 to stage 6 (Hall et al., 1977). Therefore, we expected the profile to peak successively from *self-concern* to *task concern* and finally at *impact concern* as innovation unfolds (Hall et al., 1977). However, in this study, teachers showed higher *self-concerns* and *impact concerns*, while their *task concerns* were significantly lower. This unexpected finding is consistent with several existing research that revealed the conflicts with Hall et al.'s (1997) assumption. More broadly, in the existing studies, the adoption of innovation is a complex process in practice, and the development of teachers' concern stages is not always along a single sequential direction (Cheung et al., 2001). For example, many studies (Dele-Ajayi et al., 2021; Dörenbacher-Ulrich et al., 2020; Magallanes et al., 2022) pointed out that teachers simultaneously exhibited intense concerns at several levels. While the CBAM is a robust and empirically grounded theoretical model for implementing educational innovations (Hall & Hord, 1987), its theoretical claims should not be taken for granted when applied to new reforms.

Regarding this research, teachers' high *self-concern* is easy to understand, but so is their high *impact concerns*. Covey (1991) highlighted "*Begin with the end in mind*" and "*Synergize*" as two of the seven habits of highly effective people. Teachers think about the impact of teaching thinking and how others do it before practising it, which perfectly fits these two habits. Some existing research also revealed that non-experienced teachers appeared to have intense *impact concerns* (Dele-Ajayi et al., 2021; Dörenbacher-Ulrich et al., 2020; Magallanes et al., 2022).

Although belonging to *impact concerns*, teachers' deeper concerns in the *Refocusing* stage, which was even significantly higher than that in the *Management* stage belonging to *task concerns*, attracted our attention. Theoretically, teachers' concerns in the *Management* stage should be higher than the three sub-stages of all *impact concerns*, including refocusing, because they should first manage to learn how to implement the reform better and then seek better solutions. The findings of this study suggested that teachers are already seeking alternatives before trying to learn. A possible explanation is that teachers encountered difficulties when implementing teaching thinking but did not have effective ways and means to overcome the difficulties. As teaching thinking is a prescribed action of curriculum standards, teachers must constantly find easy-to-use methods to complete this prescribed action. This phenomenon can also be well explained by the *belief-action*

gap (Kretzschmar, 1997; Long et al., 2021) and the *theory-practice gap* (Roth et al., 2014). From the perspective of the belief-action gap, *self-concern* and *impact concern* are more closely related to teachers' beliefs about thinking teaching. In contrast, *task concern* is more closely related to teachers' actions. From the perspective of the theory-practice gap, the *Informational* phase is closer to the theory. At the same time, it is necessary to overcome many problems related to specific tasks in the practice process. One Chinese Professor's famous saying, "A specific profound" can also be a good explanation of this phenomenon, that is, the theory of teaching thinking may be attracting to teachers, but it will become very profound and challenging to grasp when it comes to specific teaching scenes. Therefore, the teacher professional development programs about teaching thinking need to provide teachers with more concrete cases consistent with the theoretical models to help teachers overcome the two gaps mentioned above.

5.2 Demographic Variables Predicted Teachers' Concern About Teaching Thinking

This study found that demographic variables had a significant impact on teachers' concerns at other stages differently except for the *Consequence* stage.

When examining the *Informational* and *Personal* stages, this study revealed that female teachers expressed higher concerns than male teachers, and more experienced teachers showed increased concerns in both stages. Additionally, school level played a significant role, and middle and high school teachers expressed much deeper concerns than those in primary schools. This is supported by several studies (George et al., 2006; Lau & Jong, 2023), which suggest that increased concerns may be due to the complexities of managing different subject areas at different levels of schools.

Moreover, in the *Management* stage, gender, teaching experience, and roles in their schools revealed a significant relationship. The study suggests that more experienced teachers, particularly female teachers, express higher concerns. Christou et al. (2004) also suggested that teachers with different teaching experiences expressed various types or intensities of concerns associated with managing tasks related to a new curriculum. Likewise, in this relationship, school level played a crucial role; mainly, middle, and high school teachers reported higher concerns than primary school teachers. Additionally, indirect experiences, such as accumulated subject teaching experiences and management roles, reduce teachers' *Management* concerns, and facilitate a smoother transition to the *Consequences* stage. This idea was also supported by the study conducted by Cheung and Yip (2004) and the researcher Kwok (2014), who showed that examining cultural context is especially important for this stage.

In the *Collaboration* stage, more experienced educators expressed deeper concerns and teachers with higher degrees demonstrated improved skills in acquiring new information. Indeed, higher academic degrees increase comfort and proficiency in collaborative efforts during educational changes (Magallanes et al., 2022; Makwinya et al., 2022). However, demographic variables like gender, age, education level, and school location do not significantly impact concerns at this stage.

In the *Refocusing* stage, teachers' concerns were significantly influenced by gender, education level, and teaching experiences. Female teachers and those with higher education levels showed lower levels of concern in this stage, while more experienced teachers expressed higher concerns. With the alignment of our findings, at the *Refocusing* stage, Kwok (2014) found that experienced teachers exhibit higher concerns compared to less-experienced counterparts. The primary reasons for these concerns are linked to reflection on past experiences and a commitment to enhancing instructional approaches. Additionally, this study suggested that, during the *Refocusing* stage, experienced teachers are more engaged in evaluating and refining their instructional methods based on their accumulated teaching experiences, contributing to their elevated concerns.

5.3 Implications for Practice

The findings of this study can provide two implications for designing, developing, and implementing teachers' professional development for teaching thinking. On the one hand, as teachers have deeper concerns at the *impact stages* (i.e., *Consequence*, *Collaboration*, and *Refocusing*), professional development programs should provide more detailed and vivid cases of teachers and students who benefit from adopting teaching thinking and provide various collaboration opportunities for teachers. Conversely, considering that teachers show relatively lower concern in the *task stage* (i.e., *Management*), professional development programs must provide more concrete and operable methods and cases and help teachers achieve professional growth by constructing researcher-practitioner partners.

5.4 Limitations and Future Work

There are several limitations in this study. First, this study solely conducted a cross-sectional evaluation of teachers' concerns about teaching thinking. Hall et al. (1973) assumed that teachers would gain new knowledge

and undergo significant changes with time and the ongoing implementation of the reform. Therefore, it is necessary for additional research to trace the longitudinal development of teachers' concerns about teaching thinking and identify the factors that influence these concerns over time. The impact of professional development programs on changes in the SoC will provide a more comprehensive understanding. Second, the study focused exclusively on teachers' concerns about teaching thinking, lacking an exploration of teachers' implementation status from a behavioural perspective. Hall (1974) pointed out that the stage of teachers' concern about an educational innovation does not always correspond simply to the level of use. Future studies can adapt and utilise the *Level of Use* questionnaire (Hall et al., 1977) to measure teachers' use levels further and explore their relationship. Finally, the demographic variables considered in this study are relatively limited, and teachers' concerns and implementation of teaching thinking not only depend on personal background factors but may also be related to subjective factors such as personality types and self-efficacy. Subsequent work can integrate variables from multiple subjective dimensions to explore the impact of individual differences on the concerns about teaching thinking.

6. Conclusions

With the CBAM as a theoretical framework, this study explored Chinese in-service teachers' concerns about teaching thinking in the broader context of education reform. This study adapted the SoC questionnaire to fit the context of teachers' professional development in teaching thinking and validated its reliability and validity. This study found the complexity of teachers' concerns about teaching thinking and suggested that the commonly recognised seven-stage SoC model might not wholly capture the intricate dynamics influenced by individual differences and the multifaceted nature of educational reform. Notably, this study highlighted the teachers' relatively lower concerns at the *Management* stage and higher concerns at the *Refocusing* stage, which implied that teachers did not go all out but sought optional solutions when obstacles came. Furthermore, this study revealed various demographic factors influencing teachers' concerns at each stage differentially.

The findings of this study have several contributions. First, this study enriched the application scenarios of the CBAM by extending the SoC to the contexts of teaching thinking, an educational innovation in the 21st century worldwide. Second, this study contributes to the teaching thinking community by disclosing teachers' concerns about teaching thinking from a dynamic and progressive perspective. Most importantly, this study revealed teachers' low concerns at the *Management* stage (*task concern*), which reminds teachers that education institutes need to tailor the professional development courses that can help teachers pass through the "choke point".

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Appendix

Table A1. Demographic information of the participants

Characteristics	Categories	Frequency	Percentage (%)
Gender	Male	76	20.82%
	Female	289	79.18%
Age	Under 25 years old	47	12.88%
	26-35 years old	137	37.53%
	36-45 years old	99	27.12%
	46-55 years old	78	21.37%
	More than 56 years old	4	1.10%
Education level	Associate or below	15	4.11%
	Bachelor	277	75.89%
	Master	72	19.73%
	Ph. D	1	0.27%
School level	Primary school	260	71.23%
	Middle school	50	13.70%
	High school	55	15.07%
School location	Urban	289	79.18%
	Suburban	47	12.88%
	Rural	29	7.95%
Subject	Chinese	140	38.36%
	Mathematics	67	18.36%
	English	35	9.59%
	Science	16	4.38%
	Physics	8	2.19%
	Chemistry	19	5.21%
	Biology	11	3.01%
	History	2	0.55%
	Geography	9	2.47%
	Politics	13	3.56%
	IT	8	2.19%
	Music	6	1.64%
	Arts	7	1.92%
	PE	10	2.74%
Others	14	3.84%	
Teaching experience	<10 years	179	49.04%
	10-20 years	66	18.08%
	21-30 years	96	26.30%
	>= 31 years	24	6.58%
Employment (roles in the school)	Managers	168	46.03%
	Teachers	197	53.97%

Table A2. Survey items and results of the CFA, factor loadings, and reliabilities of the model.

Items	Description	Mean	SD.	Factor Loadings	CR
Awareness (Cronbach's $\alpha = 0.695$)		2.37	0.91		0.450
A1	I don't know what teaching thinking is.	1.86	0.97	0.696	
A2	I am not concerned about teaching thinking at this time.	1.59	0.76		
A3	I am preoccupied with things other than teaching thinking.	2.44	1.12	0.668	
A4	I don't know much about teaching thinking, but I'm interested in it and want to know more.	2.82	1.35	0.646	
A5	Currently, I'm not interested in learning how to do teaching thinking.	1.68	0.82		
Informational (Cronbach's $\alpha = 0.919$)		3.77	0.95		0.926
I1	I have a very limited knowledge of teaching thinking.	2.69	1.06	0.331	
I2	I would like to discuss the possibility of using the teaching thinking.	3.46	1.18	0.745	
I3	I would like to know what resources are available if we decide to adopt teaching thinking.	3.89	1.01	0.899	
I4	I would like to know what the use of teaching thinking will require in the immediate future.	3.86	1.02	0.937	
I5	I would like to know how teaching thinking is better than what we have now.	3.89	1.01	0.889	
Personal (Cronbach's $\alpha = 0.948$)		3.96	0.90		0.948
P1	I would like to know the effect of implementing teaching thinking on my professional status.	3.28	1.16	0.423	
P2	I would like to know what impact implementing teaching thinking might have on my professional development.	3.93	0.92	0.849	
P3	I would like to know how my teaching or administration is supposed to change.	3.99	0.90	0.905	
P4	I would like to have more information on time and energy commitments required by teaching thinking.	3.93	0.90	0.928	
P5	I would like to know how my role will change when I am using teaching thinking.	3.99	0.86	0.941	
Management (Cronbach's $\alpha = 0.915$)		3.19	1.15		0.916
M1	I am concerned about not having enough time to organize myself each day.	2.91	1.13	0.815	
M2	I want to know how to deal with the contradiction between teaching thinking requires a lot of teaching time and insufficient class hours.	3.56	1.07	0.704	
M3	I am concerned about my inability to manage all the teaching thinking requires.	3.24	1.13	0.822	
M4	I am concerned about time spent working with nonacademic problems related to	3.08	1.15	0.917	

	teaching thinking.				
M5	I am concerned about that I'll have to spend a significant amount of time dealing with formal issues related to teaching thinking.	3.14	1.15	0.876	
	Consequence (Cronbach's $\alpha = 0.931$)	4.19	0.76		0.933
Con1	I am concerned about students' attitudes and feelings toward teaching thinking.	4.16	0.79	0.825	
Con2	I am concerned about how teaching thinking affects students.	4.26	0.73	0.891	
Con3	I am concerned about evaluating the impact of teaching thinking on students.	4.25	0.76	0.917	
Con4	I'm concerned about parents' and society's attitudes toward my implementation of teaching thinking.	4.08	0.78	0.759	
Con5	I would like to use feedback from students to adjust the teaching thinking.	4.22	0.73	0.889	
	Collaboration (Cronbach's $\alpha = 0.957$)	4.14	0.78		0.958
Col1	I would like to help other faculty in their use of teaching thinking.	4.09	0.81	0.890	
Col2	I would like to develop working relationships with both our faculty and outside faculty using teaching thinking.	4.14	0.77	0.939	
Col3	I would like to familiarize other departments or people with the progress of this new approach of teaching thinking.	4.04	0.84	0.879	
Col4	I would like to coordinate my effort with others to maximize effects of teaching thinking.	4.18	0.76	0.927	
Col5	I would like to know what other faculty are doing in the area of teaching thinking. I want to know how other colleagues conduct teaching thinking.	4.25	0.70	0.896	
	Refocusing (Cronbach's $\alpha = 0.909$)	3.91	0.87		0.918
R1	I want to know of some other approaches that might work better.	3.67	1.03	0.638	
R2	I am concerned about revising my use of teaching thinking.	3.88	0.83	0.853	
R3	I would like to revise the instructional approach of teaching thinking.	3.87	0.86	0.841	
R4	I would like to modify our use of teaching thinking based on the experiences of our students.	4.05	0.76	0.932	
R5	I would like to determine how to supplement, enhance, or replace teaching thinking.	4.09	0.80	0.872	

Table A3. Regression results with the seven stages regressed on multiple predictors(detailed)

Variables	B	SD	Beta	T	Sig
DV:					
Awareness					
IV:					
Gender	0.112	0.131	0.050	0.857	0.392
Age	0.032	0.092	0.035	0.346	0.729
Education level	-0.263	0.103	-0.136	-2.552	0.011 *
School level	0.271	0.075	0.220	3.610	0.000***
School location	0.069	0.068	0.052	1.008	0.314
Subject	0.032	0.011	0.149	2.838	0.005**
Teaching experience	-0.140	0.092	-0.154	-1.524	0.128
Employment	0.256	0.116	0.140	2.205	0.028*
DV:					
Informational					
IV:					
Gender	0.350	0.140	0.150	2.510	0.013*
Age	0.117	0.098	0.123	1.199	0.231
Education level	0.116	0.110	0.058	1.057	0.291
School level	0.208	0.080	0.162	2.598	0.010*
School location	-0.051	0.073	-0.037	-0.697	0.486
Subject	0.012	0.012	0.054	1.012	0.312
Teaching experience	-0.253	0.098	-0.267	-2.576	0.010*
Employment	-0.137	0.124	-0.072	-1.103	0.271
DV:					
Personal					
IV:					
Gender	0.313	0.122	0.153	2.568	0.011*
Age	0.074	0.085	0.089	0.869	0.385
Education level	0.003	0.096	0.002	0.032	0.975
School level	0.141	0.070	0.125	2.013	0.045*
School location	-0.075	0.064	-0.062	-1.175	0.241
Subject	0.019	0.011	0.095	1.777	0.076
Teaching experience	-0.251	0.086	-0.302	-2.931	0.004**
Employment	-0.250	0.108	-0.149	-2.310	0.021*
DV:					
Management					
IV:					
Gender	0.400	0.141	0.167	2.825	0.005**
Age	-0.055	0.099	-0.056	-0.552	0.581
Education level	-0.164	0.111	-0.080	-1.475	0.141
School level	0.271	0.081	0.206	3.336	0.001**
School location	0.044	0.074	0.032	0.600	0.549

Subject	0.003	0.012	0.014	0.259	0.796
Teaching experience	-0.160	0.099	-0.165	-1.610	0.108
Employment	0.030	0.126	0.015	0.236	0.814
DV:					
Consequence					
IV:					
Gender	0.049	0.101	0.030	0.491	0.624
Age	0.004	0.070	0.006	0.055	0.956
Education level	0.107	0.079	0.076	1.356	0.176
School level	0.010	0.058	0.011	0.166	0.868
School location	-0.048	0.053	-0.050	-0.913	0.362
Subject	-0.007	0.009	-0.045	-0.823	0.411
Teaching experience	0.065	0.071	0.098	0.918	0.359
Employment	-0.050	0.089	-0.038	-0.565	0.572
DV:					
Collaboration					
IV:					
Gender	-0.089	0.106	-0.050	-0.838	0.402
Age	-0.109	0.074	-0.151	-1.469	0.143
Education level	0.129	0.084	0.085	1.539	0.125
School level	0.030	0.061	0.031	0.495	0.621
School location	-0.090	0.055	-0.087	-1.616	0.107
Subject	-0.008	0.009	-0.049	-0.913	0.362
Teaching experience	0.147	0.075	0.206	1.975	0.049*
Employment	-0.166	0.094	-0.115	-1.758	0.080
DV:					
Refocusing					
IV:					
Gender	-0.045	0.109	-0.025	-0.412	0.680
Age	-0.038	0.077	-0.051	-0.496	0.620
Education level	0.222	0.086	0.142	2.576	0.010*
School level	0.017	0.063	.017	0.268	0.789
School location	-0.089	0.057	-0.084	-1.553	0.121
Subject	0.011	0.010	0.065	1.200	0.231
Teaching experience	0.148	0.077	0.201	1.922	0.055
Employment	-0.009	0.097	-0.006	-0.089	0.929

Note. DV= Dependent Variable, IV=Independent Variable * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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