Exploring achievement-level differences in implementing self-regulated learning instruction in a classical Chinese reading intervention program

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Research on self-regulated learning (SRL) instruction typically treats students as a homogeneous group, without considering the possible effects of students' prior level of SRL competence on the implementation and effectiveness of SRL instruction. To fill this research gap, this study explored the differences in learning outcomes among students with different achievement levels who received an SRL-based classical Chinese reading instruction program. Sixty seven ninth graders from two classes, one with high achievers and the other with moderate achievers, from one secondary school in Hong Kong participated in an intervention program designed by this study's researchers. The study adopted qualitative methods, including classroom observations, teacher and student interviews, along with supplementary quantitative methods, including reading test and questionnaire, to explore the differences between the two achiever-groups when the intervention program was implemented. The results showed that the two classes differed on students' SRL performance, the degree of teacher support and student autonomy, and students' perceptions of SRL instruction. Implications of the findings for SRL research and intervention design are discussed.

KEYWORDS

achievement-level differences, reading intervention, self-regulated learning instruction, Chinese students, teacher implementation

Introduction

Self-regulated learning (SRL) is an active and constructive learning process through which learners set learning goals and accordingly monitor, regulate, and control their cognition, motivation, and behavior toward their goals (Winne and Perry, 2000; Pintrich and Zusho, 2002). With extensive evidence on the positive influence of SRL on both student learning and achievement (Zimmerman, 2001; Broadbent and Poon, 2015), researchers have emphasized the importance of integrating SRL into classroom practices

to facilitate essential skill development both in and beyond school (Dignath and Büttner, 2018; Schunk and Greene, 2018). However, most studies on SRL instruction treat students as a homogeneous group, without considering the possible effects of students' prior level of SRL competence on the implementation and effectiveness of SRL instruction. This study seeks to fill this gap by exploring the differences in learning outcomes among students with different achievement levels when they underwent an SRL-based classical Chinese (CC) reading instruction program. The aim is to generate insights into how SRL interventions can be customized to meet individual student needs.

Self-regulated learning and self-regulated learning instruction

Self-regulated learning is an important area of research in educational psychology (Panadero, 2017). While its definitions vary across different SRL models, most researchers agree that SRL commonly involves three core components–cognitive, metacognitive, and motivational aspects–and three cyclical phases of learning–forethought, performance, and reflection (Zimmerman, 2001; Stoeger et al., 2015; Usher and Schunk, 2018; Greene et al., 2019). Self-regulated learners exercise metacognition by analyzing the demands of tasks, setting appropriate goals to guide their learning, and making critical reflections on their learning process and results. They are also motivated to learn actively and strategically by applying a repertoire of effective strategies to self-monitor their learning process, and optimize their learning performance accordingly (Perry et al., 2007; Dignath and Büttner, 2018).

Many researchers have emphasized the importance of classroom context/characteristics in facilitating or inhibiting students' development of SRL (Lombaerts et al., 2009; Neitzel and Connor, 2017; Dignath and Büttner, 2018). We can synthesize four major instructional principles from the literature regarding the classroom instruction features that support students in SRL (van Grinsven and Tillema, 2006; Housand and Reis, 2008; Lombaerts et al., 2009; Perry and Rahim, 2011; Stoeger et al., 2015; Neitzel and Connor, 2017; Jayawardena et al., 2019; Mohammadi et al., 2020; Dignath and Veenman, 2021; Cousins et al., 2022): (1) Task nature: Teachers provide explicit learning strategy instruction, and design open, complex, and authentic learning materials and activities to facilitate higher-order thinking skills and learning motivation. (2) Teacher support: Teachers use direct instruction, modeling, coaching, scaffolding, and feedback to support SRL skills learning. (3) Student autonomy: Student-directed activities are designed such that students can practice their SRL skills by gaining control over the learning process. (4) Evaluation practices: Mastery-oriented assessments, and both self- and peer-evaluations are used to enhance metacognition and self-efficacy.

Student achievement-level differences in self-regulated learning

Very few studies have investigated how individual student differences may affect the implementation of SRL instruction (Dörrenbächer and Perels, 2016). Studies have indicated that high achievers (HAs) generally have higher SRL competence than low achievers (LAs) in terms of disciplinary knowledge, strategy use, metacognition, self-efficacy, and learning motivation (Broadbent and Poon, 2015; Emagnaw, 2019; Bai et al., 2021). In a think-aloud study, Heirweg et al. (2020) also found clear differences in the quality of students' SRL processes: HAs showed a more strategic and adaptive approach to learning during all learning processes compared to LAs and average achievers. HAs were more capable of strategically and effectively planning their tasks, combining different cognitive strategies, and adopting self-evaluations to regulate their learning process. Thus, as different achievers have different SRL levels before receiving SRL instruction, they may also have different responses, and thus, display different degrees of improvement after the intervention.

However, there are competing views regarding which achiever groups may benefit the most from SRL instruction. Since SRL is challenging for students, some researchers believe that HAs will benefit more than LAs. This is because HAs are able to control their cognition more efficiently, and thus, learn and apply SRL skills more easily (Hattie et al., 1996; Otto and Kistner, 2017). This hypothesis suggests that teaching SRL skills to students of different achievement levels may exacerbate the Matthew effect: more competent students will gain more from the intervention than their less competent counterparts, thus leading to greater differences and inequalities (Dörrenbächer and Perels, 2016). A contrary hypothesis is that LAs will benefit more from SRL instruction by learning and practicing the newly learned SRL skills, whereas HAs with high-baseline SRL levels have little room for improvement (Zohar and Peled, 2008; Dörrenbächer and Perels, 2016; Peeters et al., 2016). Researchers who hold this view propose a compensation effect, suggesting that SRL instruction is likely to help LAs develop strategies to compensate for their low cognitive abilities. Studies do find different effects of SRL instruction due to different student achievement levels. Essentially, either HAs (Otto and Kistner, 2017), LAs (Zohar and Peled, 2008), or moderate achievers (MAs) (Dörrenbächer and Perels, 2016) benefit the most, or that there are no differential effects for specific achiever groups (Stoeger and Ziegler, 2010; Donker et al., 2014).

The majority of SRL studies on students' achievement-level differences adopt quantitative designs to compare pre- and post-test measures. However, since students must participate actively and engage in higher-level thinking while receiving SRL instruction (Perry et al., 2002; van Grinsven and Tillema, 2006), their baseline SRL condition should substantially affect both teaching and learning processes during the intervention.

For instance, studies exploring teacher-related factors reveal that student achievement levels influence teachers' willingness to as well as the degree to which they adopt SRL instruction. SRL instruction is more frequently observed among HAs than among LAs (Guo et al., 2019). Teachers do not tend to teach SRL skills to LAs to the same extent as they do to HAs because they believe that LAs are incapable of self-regulating the learning process (Zohar and Peled, 2008; Lau and Chen, 2013; Peeters et al., 2016; Yan, 2018). Some researchers have also noted that LAs require more intensive teacher support and a longer period to develop their SRL skills as they have weak SRL foundations and poor motivation (Zohar and Peled, 2008; Dörrenbächer and Perels, 2016). This suggests that achievement-level differences may exist when teachers implement SRL instruction for different achiever groups.

Achievement-level differences in classical Chinese reading instruction

Classical Chinese is the official written language in ancient China (Wang, 1979). Learning to read CC is a core component of the language curriculum in Chinese society. The current methods of teaching and learning CC reading are deeply influenced by traditional Confucian culture. While various student-centered pedagogies have been introduced in recent years, teachers play a leading role in CC reading instruction (Tang and Sun, 2013; Lau, 2017; Song, 2021). Moreover, CC and modern Chinese have many linguistic difference; hence, many students face difficulties when reading CC texts (Chi and Chiou, 2015; Lau, 2018; Ren and Yang, 2019). This makes the students reliant on their teachers. Moreover, due to these reading difficulties, students usually demonstrate very low confidence and lack intrinsic interest in reading CC texts (Lau, 2019; Song, 2021). Hence, the traditional teacher-centered approach, and students' poor CC reading ability and motivation may increase the difficulty of implementing SRL instruction in teaching CC reading.

Some researchers have suggested that student SRL levels vary owing to the different cognitive demands of each academic subject (Dignath and Büttner, 2008; Virtanen and Nevgi, 2010; Cousins et al., 2022). To overcome the difficulties in CC reading, Chinese scholars have proposed that students must be equipped with sufficient knowledge of the CC language and ancient Chinese culture, and learn how to use various CC reading strategies effectively (Zhao, 2004; Shangguan, 2008; Chi and Chiou, 2015; Lau, 2018). Moreover, considering the difficulty involved in CC reading, students with better knowledge backgrounds and cognitive competences may benefit more if SRL instruction is implemented for CC reading. Thus, achievement-level differences may be more robust.

Purpose of the study

This study was part of a research project titled "The effectiveness of self-regulated learning-based instruction on students' classical Chinese reading comprehension and motivation." This project aimed to integrate SRL into CC reading instruction to enhance CC reading competence and motivation among students in Hong Kong. The data used here were mainly drawn from two experimental classes to explore possible achievement-level differences during and after the implementation of the SRL intervention program. Only a few recent studies have examined the differential effects of SRL instruction on students of different achievement levels using quantitative methods; moreover, their results are inconsistent. Hence, this study adopted qualitative methods supplemented by quantitative methods to generate new insights into how SRL interventions can be customized to meet individual student needs. The theoretical framework is illustrated in **Figure 1**.
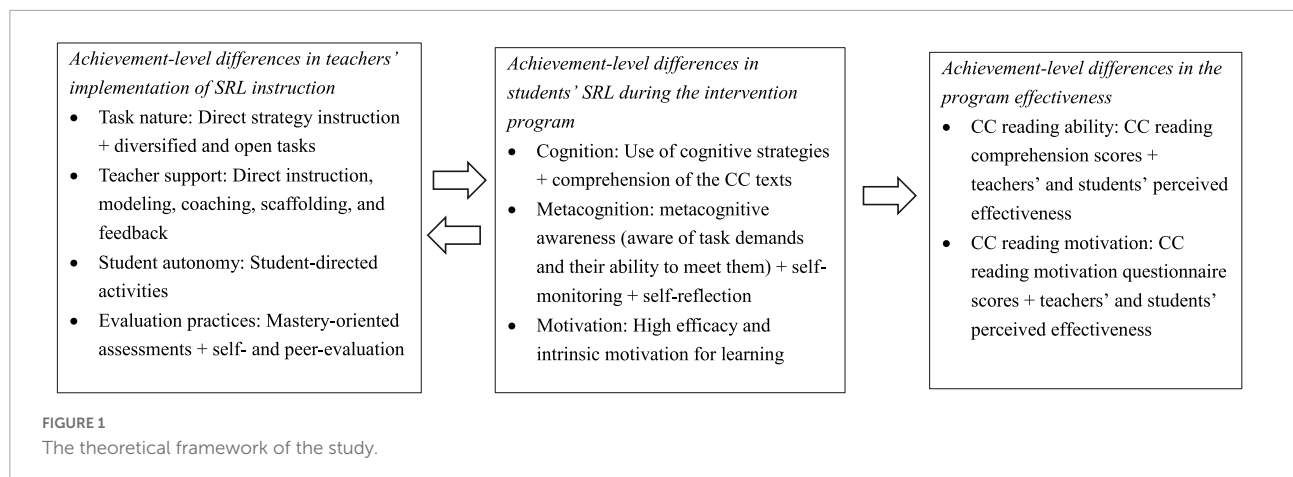
The research questions were as follows:

1. What were the differences in SRL performance between the two achievement groups when they underwent the SRL intervention program?
2. What were the differences in teachers' implementation of SRL instruction between the two achievement groups?
3. What were the differences in the effectiveness of the SRL intervention program between the two achievement groups?

This study addresses several unexplored issues in the SRL literature. First, studies on the SRL instruction implementation process have primarily focused on teaching influences while ignoring the key role of students. This study offers a new perspective on which factors influence the implementation of SRL instruction. Second, most studies regard students as a homogenous group when evaluating the effectiveness of SRL instruction. While a few recent studies have examined the differential effects of SRL instruction on students with different achievement levels, the results have been inconsistent. Third, while most SRL intervention studies have only used quantitative approaches to compare the learning outcomes of different achiever groups, this study adopts both quantitative and qualitative methods. Thus, its findings can generate new insights into how SRL interventions can be customized to meet individual student needs.

Materials and methods

Participants

One secondary school in Hong Kong was invited to implement this study's intervention program among Grade 9

Achievement-level differences in teachers' implementation of SRL instruction
- Task nature: Direct strategy instruction + diversified and open tasks
- Teacher support: Direct instruction, modeling, coaching, scaffolding, and feedback
- Student autonomy: Student-directed activities
- Evaluation practices: Mastery-oriented assessments + self- and peer-evaluation

Achievement-level differences in students' SRL during the intervention program
- Cognition: Use of cognitive strategies + comprehension of the CC texts
- Metacognition: metacognitive awareness (aware of task demands and their ability to meet them) + self-monitoring + self-reflection
- Motivation: High efficacy and intrinsic motivation for learning

Achievement-level differences in the program effectiveness
- CC reading ability: CC reading comprehension scores + teachers' and students' perceived effectiveness
- CC reading motivation: CC reading motivation questionnaire scores + teachers' and students' perceived effectiveness

FIGURE 1
The theoretical framework of the study.

students. The selection of the experimental school was based on the school's readiness to adopt a new approach to teaching CC reading. This school is classified as a Band 2 school, which consists mainly of the middle 33.3% of students under the Hong Kong Secondary School Place Allocation System. These students were further allocated to different classes based on their internal examination scores. Two classes from Grade 10 [Class A with high achievers ($n = 34$) and Class B with moderate achievers ($n = 33$)] were randomly assigned as an experimental group (EG), whereas, two other classes with equivalent achievement levels were assigned as a control group (CG). Data were drawn from the EG, which contained 67 combined students from two classes (34 boys and 33 girls) aged between 13 and 15 years (mean = 14.02 years, SD = 0.60). The two EG classes did not differ significantly in terms of sex distribution or age. All study participants provided informed consent and the study design was approved by the appropriate ethics review board.

Instruments

Classical Chinese reading comprehension test

A CC reading comprehension test was designed to assess students' CC reading ability. It consisted of one narrative and one argumentative text. Five "word interpretation" questions and nine "text comprehension" questions were designed for each text. Each test item was scored on 0 to 2 points, with a total score of 56.

Classical Chinese reading questionnaire

The questionnaire consisted of three sections. The first section assessed students' frequency of using various word- (Zhou, 2007; Wei, 2009) and text-level strategies (Pressley and Afflerbach, 1995; Mokhtari and Reichard, 2002) when reading CC texts. The second section measured students' familiarity with linguistic (Pulleyblank, 1995; Zhang, 2005) and content knowledge (Xiong, 1993; Zhao, 2004) essential to CC reading.

The third section measured students' self-efficacy, intrinsic motivation, and extrinsic motivation in CC reading (Lau, 2004).

Classroom observations

An adapted observation form was designed based on Perry (1998) and Perry et al. (2007) to ascertain how SRL instruction was implemented during the intervention program. The form contained four sections: the first and second were used to record background information and maintain a running record of classroom events; the third was designed to record information related to the four major SRL instructional principles; and the fourth was used to record students' SRL-related behaviors and performance.

Semi-structured student group interviews

Each interview included two sets of questions. In the first set, students were asked about their strategy usage, prior knowledge, and motivation to read CC texts during the module. This was designed to understand their learning progress and level of SRL. For the second set, students were asked about their general views and perceptions of the program's usefulness.

Semi-structured teacher interviews

Each interview included two sets of questions. The first set focused on intervention implementation. Teachers were asked whether they had used all learning materials and activities in the module, as well as their reasons for doing or not doing so. The second set of questions focused on how teachers evaluated students' SRL performance and the effectiveness of SRL instruction in enhancing student CC.

Procedure

The study lasted for 1 year and was conducted during regular school lessons. Students in both EG and CG had the same number of Chinese language lessons, and read

the same set of CC texts during the study. EG teachers implemented SRL instruction in their classes by following the instructional practices specified in an intervention package designed developed this study's researchers based on the four SRL instructional principles reviewed in the Section "Introduction." Meanwhile, CG teachers adopted traditional teacher-centered instructional practices to teach the same texts, including lecturing, questioning, and worksheet exercises. The intervention program consisted of two CC reading modules, each involving 14–16 50-min lessons. A CC reading module was arranged in each semester. A brief summary of the intervention design is presented in Table 1.

Two workshops were conducted prior to the program to introduce teachers to the intervention design as well as the concepts and principles of SRL instruction. The researchers explained the study's purpose, data collection procedures, and confidentiality rules to the teachers during the first collaborative meeting. Pretest quantitative measures were collected at the beginning of the first semester. Each experimental class was observed twice (once each during the first and second modules). Teacher interviews were arranged immediately after each classroom observation. Six students from each class with different ability levels were invited to participate in a group interview after each module. The post-test quantitative measures were collected near the end of the second semester.

TABLE 1 Brief description of the intervention design.

Principle	Instructional design
Task nature	Facilitate students' CC reading ability through strategy instruction on word interpretation, comprehension, and metacognitive strategies. Enrich students' background knowledge of CC texts by organizing the texts based on a humanistic theme of ancient Chinese culture. Design diversified and open tasks to facilitate students' use of the strategies and cultural knowledge. Select interesting supplementary materials based on the humanistic theme of each module to enhance students' motivation.
Teacher support	Provide various types of scaffolding instruction, such as direct explanation, modeling, guided practices, notes, worksheets, and feedback, to support students' learning. Gradually shift the responsibility from the teacher to students.
Student autonomy	Design student-directed activities and out-of-class eLearning tasks for students to control their learning and develop their independent reading skills. Facilitate students' collaboration through group activities.
Evaluation practices	Assess students' reading skills through open and complex tasks. Provide students with clear evaluation criteria and involve them in self- and peer evaluation.

Results

Differences in students' self-regulated learning performance during the intervention

The findings of independent samples t-tests indicated that the HAs in Class A scored significantly higher than the MAs in Class B in all pre-test quantitative measures (Table 2). This suggests that before the intervention, HAs had better SRL baseline conditions and CC reading abilities than MAs.

High achievers also outperformed MAs on different aspects of SRL during the intervention. First, regarding the cognitive aspect of SRL, HAs were more skillful than MAs in applying their newly learned strategies to achieve a more comprehensive understanding of the texts. For example, students learned the questioning strategy in the first module and then applied it during a roleplaying activity to facilitate their comprehension of a CC story. As shown in the following excerpts, HAs were able to ask high-level questions. Further, their answers reflected a comprehensive understanding of character intentions and feelings. Meanwhile, MAs usually asked simple or irrelevant questions and only gave brief answers.

Excerpts from Class A's first lesson observation are as follows (OCA20181115[1]):

HA1 [*questioner*]: Stepmother, why is it that you treated your stepson well when your husband was alive but treated

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1 Each interview or observation code was composed of the research method (SI, student interview; TI, teacher interview; O, observation), class code (CA, Class A; CB, Class B), and interview or observation date. TA and TB represent the teachers of Classes A and B, respectively. HA and MA represent students from Classes A and B, respectively.

TABLE 2 Pre-test comparisons on the two experimental classes.

Variables	Mean scores		*t*-value
	Class A	Class B	
Reading comprehension test	27.76	22.97	2.31*
Use of reading strategy			
Word-level strategy	4.01	3.47	3.05**
Text-level strategy	3.63	3.19	2.46*
Prior knowledge			
Linguistic knowledge	3.64	3.04	2.61*
Content knowledge	3.53	2.94	2.75**
Reading motivation			
Self-efficacy	3.12	2.51	2.50*
Intrinsic motivation	3.03	2.48	2.10*
Extrinsic motivation	3.96	2.95	3.80***

The full score of the reading comprehension test is 56. All questionnaires are rated on a 6-point Likert scale. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

him badly after your husband died? Did you want to take revenge on him? Later, you treated him well again. Was it because you want him to treat you well when you grow old?[2] [*The questions covered all story contents and challenged the role player to explain the character's intentions in detail.*]

HA2 [*playing the role of the stepmother*]: Of course not. I treated him well because when his father was alive, he was willing to study. When his father passed away, he became lazy and refused to study. I hope this experience will teach him to cherish the opportunity to study. [*This answer reflected that HA2 accurately comprehended the implicit meaning of the story.*]

Excerpts from Class B's first lesson observation are as follows (OCB20181115):

MA1 [*questioner*]: Stepson, which do you like better: feeding the pigs or going to school? [*Simple "yes/no" question*].

MA2 [*playing the role of the stepson*]: Feeding the pigs. [*This answer contradicted the meaning of the story*].

MA3 [*questioner*]: Servant, why do you keep cleaning the board? [*An irrelevant question*].

MA4 [*playing the role of the servant*]: Because I am a servant. [*A meaningless answer*].

Second, regarding the metacognitive aspect of SRL, HAs had clear ideas about the learning objectives, activity requirements, and standards of good strategy use in the two observed lessons. For example, when students in Class A misinterpreted a CC text, their classmates immediately pointed out the problem without waiting for the teacher's instruction. The teacher of Class A (Teacher A) also found that her students could make precise self- and peer-evaluations.

TA: After the group presentation, I noticed some unsatisfactory performances. I asked students for their comments and they were able to point out their problems . . . They were also able to give their peers constructive feedback. (TICA20190530)

Meanwhile, MAs' performance in the first observed lesson indicated that they did not have clear ideas about the learning goals and learning task requirements. They simply followed their teacher's instructions, and relied heavily on her guidance and feedback to gauge their performance. Class B's teacher (Teacher B) said that her students' responses to the self-reflection form were very simple, indicating poor metacognitive ability.

Third, regarding the motivational aspect of SRL, HAs showed more confidence than MAs while participating in class activities. For example, while most HAs asked fluent questions

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2 All lessons and interviews were conducted in Cantonese. The excerpts in this paper are verbatim translations.

and promptly responded to their classmates' questions, most MAs read questions with uncertainty and always hesitated to provide answers. During the interviews, some MAs said they would avoid reading CC texts, while some HAs said they regarded CC reading as a platform for demonstrating their abilities.

MA4: I want to avoid reading CC texts as I find them very difficult. (SICB20181210)

HA3: I like CC reading . . . because if other students fail to get the meaning but I can get it, I will have a sense of achievement. (SICA20181210)

High achievers also had higher levels of intrinsic and extrinsic motivation for CC reading than MAs. Most MAs said that they disliked CC reading prior to the intervention because of its difficulty.

Some HAs said they liked CC reading for intrinsic reasons, whereas others said they were willing to learn CC texts for extrinsic reasons.

MA6: I don't like [CC reading] because I do not understand it. (SICB20181210)

HA6: I find CC texts interesting. Although CC words are difficult, I like the stories in the texts. (SICA20181210)

HA1: I'm neutral. If I get better examination scores in CC reading, I will like it more. (SICA20181210)

In the observed lessons for Class A, HAs were always active and willing to interact with their peers. A few HAs demonstrated high degrees of extrinsic motivation by showing off their good comprehension abilities and strategic skills during the observed lessons. Although students in Class B generally enjoyed the activities and displayed involvement during the observed lessons, some intentionally asked irrelevant questions to make their peers laugh, whereas others were inattentive.

Differences in teachers' implementation of self-regulated learning instruction

During interviews, both teachers and students in the two classes reported that before the study, traditional teacher-centered instruction was the major instructional approach to teaching CC texts and that the teachers made obvious changes when implementing the intervention program. The observed lessons entailed a similar nature of task because both teachers followed the intervention package to deliver their lessons. However, there were notable differences between the two classes regarding the teachers' and students' roles. Class A generally demonstrated a high degree of student autonomy and low degree of teacher support. These students played the dominant

role in most activities. They had a proficient grasp of the CC texts and activity procedures, actively participated in activities, and commented on peer performance. Teacher A said that before participating in the project, she was worried about how her students would adapt to the new instructional approach. Their good performance was beyond her expectations. This made her believe that they could develop into self-regulated learners, thereby encouraging her to give them a higher degree of autonomy.

TA: Their performance was beyond what I had expected. Most of them were well-prepared and involved in the activity. … The most impressive change I made was being able to release my hold of the classroom. In this lesson, I only talked for about 5–10 min. Through interactions with their peers, students inspired each other to think deeper. I gradually realized that both students and I were readers [of the same level]. They also inspired me a lot. (TICA20181115)

The situation in Class B was different. As mentioned above, the MAs in Class B only had a rough understanding of the CC texts, used surface-level reading strategies, lacked confidence, and tended to play rather than learn seriously during class activities. Furthermore, a high degree of teacher support was observed in Class B. Teacher B used various scaffolding strategies to engage her students in meaningful learning, including giving detailed explanations and clear directions, modeling how to use strategies, providing individualized guidance to different groups, and giving prompts and directive feedback to students when they failed to answer questions or misuse the strategies. The example below illustrates how Teacher B helped her students improve their questioning and answering skills.

Excerpts from Class B's first lesson observation (OCB20181115):

MA3 [questioner]: Servant, why do you keep cleaning the board? [An irrelevant question].

MA4 [playing the role of the servant]: Because I am a servant. [A meaningless answer].

TB: Good. No one asked the servant anything before. However, you have to ask the servant a meaningful question. [Gave affirmation and direction to the questioner].

MA3: What do you think about how the stepmother has treated her stepson? [A question that required the character to comment on the text content].

MA4: She wanted her son to be good, but he didn't listen to her. [An answer that showed MA4 understood the story accurately].

TB: Does anyone want to ask a follow-up question? You may try to ask about the feelings of the stepmother and her

stepson. [Gave direction and encouraged students to ask deeper questions].

MA5: Stepmother, do you feel distressed by your stepson's bad behavior? [A question concerning the character's feelings].

MA1 [playing the role of the stepmother]: Yes, I feel distressed. [A simple answer].

TB: Let's clap for them. In this round, most of the questions were straightforward and at the surface level. I hope all of you will spend more time thinking of deeper questions. Asking whether the stepmother feels distressed is good. However, try moving beyond simple "yes/no" questions. Think about what else you want to know. [Finished this round of activity by praising her students and giving concrete feedback and directions].

Students in Class B mainly played the role of "followers" during the first observed lesson. Although they were given a certain degree of autonomy because of the open nature of the activities, they tended to wait for Teacher B to give instructions and expected her to play an authoritative role during class. During the student interviews, some MAs clearly expressed that teacher guidance was important because they did not have confidence in their own interpretation of the texts.

Furthermore, Teacher B mentioned the students' weak abilities several times when discussing their unsatisfactory performance in her two interviews. She explained that she chose to guide students herself rather than letting them discuss the material among themselves because they were not skilled at group discussions. She also eliminated some student-directed activities because she believed that they were too difficult for her students. She noted:

TB: "My class is weak. The debate activity is too difficult for them. … The activity required students to be very familiar with cultural knowledge. That's why I skipped it." (TICB20190530)

Differences in the effectiveness of self-regulated learning instruction

Importantly, the pair-samples t-tests indicated that MAs improved significantly on most post-test quantitative measures, including reading test scores, prior knowledge, and intrinsic motivation. Meanwhile, HAs only showed significant improvement in their reading test scores (Table 3). MAs scored significantly lower than HAs on all pre-test measures prior to the intervention. Although their mean scores were still lower than those of HAs in all post-test measures, the findings of one-way ANCOVAs using pre-test scores as covariates indicated no significant differences between the two groups on any post-test measure (Table 4).

TABLE 3 Pre- and post-test comparisons within each experimental class.

Variable	Mean score		t-value
	Pre-test	Post-test	
High achievers in Class A			
CC reading comprehension test	27.91	31.91	3.44**
Use of CC reading strategy			
Word-level strategy	4.01	3.91	-0.87
Text-level strategy	3.69	3.63	-0.40
CC prior knowledge			
Linguistic knowledge	3.64	3.84	1.58
Content knowledge	3.53	3.76	1.46
CC reading motivation			
Self-efficacy	3.10	3.08	-0.09
Intrinsic motivation	3.04	3.03	0.06
Extrinsic motivation	3.96	3.83	-0.68
Moderate achievers in Class B			
CC reading comprehension test	23.61	28.29	4.07***
Use of CC reading strategy			
Word-level strategy	3.52	3.74	1.02
Text-level strategy	3.19	3.31	1.02
CC prior knowledge			
Linguistic knowledge	3.02	3.65	2.41*
Content knowledge	2.97	3.48	2.22*
CC reading motivation			
Self-efficacy	2.56	2.88	1.83
Intrinsic motivation	2.54	2.95	2.07*
Extrinsic motivation	3.01	3.28	1.33

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

These findings suggest that the gap between HAs and MAs in their SRL and CC reading abilities narrowed after the program.

During the interviews, both HAs and MAs had positive views on the intervention program. Most agreed that the intervention program was effective in enhancing their CC reading motivation. They liked the interesting learning materials, open tasks, and interactive activities. The task nature of SRL instruction aroused their intrinsic motivation to read CC texts and facilitated their involvement in classroom learning.

HA4: The stories in this module are interesting. After this module, I want to read more stories on this topic. (SICA20181210)

HA1: The activities are interesting. The discussions and debates with our classmates increased our interest in the texts, and we learned more than before. (SICA20190605)

MA3: I am more interested in learning CC reading now because of the many activities. It is different from previous CC reading classes that were always very boring. (SICB20190605)

TABLE 4 Group comparisons on the post-test measures among the two experimental classes.

Variables	Class	Mean score	SD	F-value (df)	Partial η^2
CC reading	A	31.91	7.52	0.92	0.015
Comprehension test	B	28.29	6.10	(1, 63)	
Use of CC reading strategy					
Word-level strategy	A	3.91	0.62	0.02	0.000
	B	3.74	1.02	(1, 63)	
Text-level strategy	A	3.69	0.59	0.57	0.009
	B	3.31	0.87	(1, 62)	
CC prior knowledge					
Linguistic knowledge	A	3.84	0.67	0.01	0.000
	B	3.65	1.28	(1, 64)	
Content knowledge	A	3.76	0.98	0.02	0.007
	B	3.48	1.18	(1, 64)	
CC reading motivation					
Self-efficacy	A	3.08	0.96	0.42	0.007
	B	2.88	1.27	(1, 60)	
Intrinsic motivation	A	3.04	1.01	0.64	0.010
	B	2.94	1.22	(1, 62)	
Extrinsic motivation	A	3.83	1.13	0.00	0.000
	B	3.28	1.25	(1, 63)	

Further, many MAs mentioned that their CC reading motivation improved because the new strategies increased their self-efficacy and intrinsic motivation toward CC reading. As shown in the following example, students' CC reading abilities, self-efficacy, and intrinsic motivations were closely related and mutually reinforced through the program:

MA4: My motivation improved. I used to be very afraid of reading CC texts because I did not understand them. Now, since the teacher has used different types of activities to help us learn the texts, I feel that learning CC reading is easier and more interesting. (SICB20190605)

Notably, some HAs said that the program did not affect their motivation because they were already highly motivated to read. This may explain why there was no significant motivational difference among HAs.

HA2: No change. I have always been interested in CC reading and continue to be interested. (SICA20190605)

Interestingly, the perception of HAs and MAs clearly differed on the intervention program's effectiveness in enhancing their CC reading abilities. During the interviews, all MAs mentioned that their CC reading skills and comprehension were significantly improved after learning the reading strategies or participating in the self-directed activities.

MA1: Yes, the program helped improve my CC reading ability. Previously, I only knew the adding strategy but now I am aware of more strategies to interpret CC words. (SICB20190605)

MA2: In Grade 7 and Grade 8, I just listened to and wrote down my teachers' explanations of the CC texts. Now, I do not just copy and recite my teacher's model answers but can understand the texts by myself through participation in the class activities. (SICB20181210)

By contrast, HAs perceived improvements in CC reading in less obvious ways than MAs did. Some HAs said that they did not gain much from the program because they were already familiar with most of the content. Others said that the program did not enhance their reading ability because the teacher spent less time explaining the meanings of the CC words than before.

HA4: Not much [improvement]. I had always used strategies to read CC texts; the module just taught me their names. (SICA20181210)

HA1: This instructional approach can enhance my interest but not my reading ability. When compared to the previous teacher-centered approach, our teacher spent less time on explaining the words of the CC texts to us. So my word-interpretation skills did not improve. (SICA20190605)

Both Teachers A and B observed that students' CC reading motivation increased during the intervention program. Owing to their students' different ability levels, Teacher A focused on higher-order thinking, whereas Teacher B was more concerned about basic foundations.

TA: All students were very involved in the activities . . . The activities were successful in linking student learning to their real lives and stimulated them to think deeper. (TICA20190530)

TB: The program helped my students establish a good foundation for CC reading. Although my class is weak, student performance exceeded my expectations. Many students were willing to participate and use the strategies . . . Now, I find that the learning atmosphere is better than before. (TICB20181115)

Discussion

This study explored the differences in learning outcomes among students with different achievement levels when they underwent an SRL instruction program. Consistent with research (Broadbent and Poon, 2015; Emagnaw, 2019; Heirweg et al., 2020; Bai et al., 2021), pre-test comparisons indicated that HAs had better baseline SRL conditions than MAs. Moreover,

during the program, HAs actively participated in student-directed activities to achieve a deeper understanding of the CC texts. By contrast, MAs required intensive guidance from teachers to complete similar tasks. This finding supports some scholarly views that better baseline SRL competence results in better learning and application of SRL skills (Hattie et al., 1996; Otto and Kistner, 2017), while weak students require more teacher support to adapt to the SRL instruction environment (Zohar and Peled, 2008; Dörrenbächer and Perels, 2016). These achievement-level differences in student SRL performance reveal that besides teachers' perceptions, student SRL levels may influence whether teachers implement this method.

Studies generally find a high degree of teacher support and a low degree of student autonomy for SRL instruction in Chinese classrooms (Lau, 2012; Lau and Chen, 2013). Meanwhile, this study found that the students' achievement level was an important factor in determining the degree of teacher support and student autonomy. Although both teachers participating in the study were used to traditional teacher-centered instruction when teaching CC texts, different degrees of teacher support and student autonomy were observed in their classes during the intervention program. The interviews indicated that students' abilities and motivation levels were the major concerns of the two teachers. HAs' good performance during student-directed activities successfully changed Teacher A's original perception and increased her willingness to allow students higher degrees of autonomy. However, MAs' unsatisfactory performance led Teacher B to maintain a more teacher-directed approach in guiding students through learning activities. Indeed, studies on SRL instruction have revealed that student characteristics are major factors affecting teachers' willingness to implement these types of programs (Peeters et al., 2016). Because SRL is challenging for many students (Schunk and Zimmerman, 1997; Perry et al., 2002), teachers typically decide whether they should use SRL instruction based on students' knowledge, strategic skills, and motivation (Zohar and Peled, 2008; Lau and Chen, 2013; Peeters et al., 2016; Yan, 2018).

Notably, there have been controversial views regarding which achiever groups benefit more from SRL instruction. Using pre- and post-test comparison methods, Zohar and Peled (2008), Dörrenbächer and Perels (2016), and Otto and Kistner (2017) found that HAs, MAs, and LAs, respectively, benefited the most from SRL instruction. Meanwhile, others find no differential effects for specific achiever groups (Stoeger and Ziegler, 2010; Donker et al., 2014). This study's findings suggest that MAs benefited more from SRL instruction than HAs. Specifically, MAs improved more than HAs, and the gap between HAs and MAs narrowed on all quantitative measures. Furthermore, while both HAs and MAs had positive perceptions of SRL instruction, more MAs agreed that SRL instruction was effective in enhancing their CC reading motivation and abilities. This may be because HAs already had basic knowledge and skills, and were motivated to read

CC texts; hence, they experienced relatively less improvement than MAs, who once regarded CC reading as very difficult. These findings support the hypothesis that SRL instruction is more useful in helping weak students develop strategies to compensate for their low cognitive abilities, whereas, HAs may have little room for improvement (Zohar and Peled, 2008; Dörrenbächer and Perels, 2016; Peeters et al., 2016).

The achievement-level differences revealed here suggest that while SRL instruction should benefit students across ability levels (Donker et al., 2014), intervention programs should be customized to individual student needs (Dörrenbächer and Perels, 2016). Among the four major principles of SRL instruction, task nature was well-received by both HAs and MAs. This suggests that direct strategy instruction, and open, authentic, and interactive learning tasks facilitate learning regardless of achievement level. For HAs with better knowledge, strategic skills, and metacognitive awareness, higher degrees of student autonomy and evaluation practices are more suitable. The good performance of HAs in strategy use, and self- and peer-evaluation suggests that involving HAs in student-directed activities and assessments should facilitate higher-order thinking, and increase their ownership and sense of achievement in learning. Student-directed activities and assessments also enhance students' abilities, self-efficacy, and intrinsic and extrinsic motivations (Panadero et al., 2017; Jayawardena et al., 2019). Although many MAs and LAs may not yet have the ability to self-regulate the learning process, teachers should not simply conclude that SRL is unsuitable for them. Rather, a high degree of teacher support should be used to help weak students establish solid foundations during the early stages of SRL instruction. The obvious improvements in the MAs observed here suggest that teachers can gradually increase the degree of student autonomy and evaluation practices when students are ready to self-regulate their learning.

Limitations and future research directions

This study offers several suggestions for further research based on its limitations.

While the findings highlight the importance of exploring students' individual differences during SRL interventions, this study only focused on achievement-level differences. Other individual differences, such as age and gender, can also influence learning in the SRL context (Pintrich and Zusho, 2002; Dignath and Büttner, 2018; Zhu and Mok, 2018). Hence, future studies should investigate whether these individual differences also affect the implementation and effectiveness of SRL instruction. Understanding the mediating effects of more student factors is useful for developing more tailor-made intervention programs to cater to the needs of different types of students.

Most studies on achievement-level differences compared HAs and LAs (e.g., Dörrenbächer and Perels, 2016; Otto and Kistner, 2017; Bai et al., 2021). However, the participating school in this study only admitted students with high and moderate achievement levels. Thus, no LAs were analyzed. Considering the clear differences between HAs and MAs observed in this study, the achievement-level differences between HAs and LAs is likely to be larger. Thus, future studies should include more students with different achievement levels to explore how differences in students' achievement may affect the implementation and effectiveness of SRL instruction. Contrary the common belief that SRL instruction is more suitable for students with high ability (Peeters et al., 2016), this study's findings indicated that MAs improved more than HAs. To the best of our knowledge, no intervention study has specifically been designed for weak students. Future studies should consider designing a tailor-made SRL intervention program for weak students, and examine how the degree of teacher support and student autonomy should be adjusted to help them develop their self-regulatory skills and confidence in learning gradually.

Finally, participant representativeness also limits the generalizability of this study as only one secondary school participated. Therefore, the performance and perceptions of HAs and MAs in this study are not representative of all HAs and MAs in Hong Kong. In addition, this study classified students into different achiever groups based solely on their school's internal examination scores. Future studies should include larger and more representative samples of students, and use more objective classification criteria.

Conclusion

This study provides several new insights on SRL instruction. First, positive perceptions of the CC intervention program among both teachers and students support the cross-cultural applicability of SRL instruction in a subject area deeply rooted in Confucian culture. Specifically, teachers and students may be more likely to accept this instruction method as it facilitates learning, regardless of whether it is consistent with or contrary to their original approaches. Second, despite their important role in SRL instruction, student-related factors have seldom been investigated in previous intervention studies. This study's findings showed that students' baseline SRL levels and class performance significantly affected the level of support provided by teachers and how much autonomy they would allow during class. This highlights the importance of student factors when investigating SRL instruction implementation. Third, significant achievement-level differences between student groups suggest the importance of exploring the possible differential effects of SRL instruction among students with different backgrounds

and characteristics rather than treating all students as a homogeneous group. This study's use of qualitative methods to collect data provides a new perspective for addressing the debate on which achiever groups benefit most from SRL instruction. On the one hand, the better performance among HAs supports the view that they are most suited to high-SRL environments. On the other hand, MAs displayed more obvious improvements through SRL instruction than HAs did because of the former's low baseline SRL. These findings suggest that all learners can benefit from SRL instruction, but the processes and mechanisms may vary between achiever groups.

Data availability statement

The datasets presented in this article are not readily available because only the principal investigator of the study can access the dataset. Requests to access the datasets should be directed to KLL, dinkylau@cuhk.edu.hk.

Ethics statement

The studies involving human participants were reviewed and approved by Survey and Behavioral Research Ethics Committee, The Chinese University of Hong Kong. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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