I Know It, I Just Can't Say It": A Mixed Methods Study of Preservice Teachers' Metacognitive Accuracy

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Abstract
Metacognitive awareness is important for preservice teachers because they should be able to plan, to implement, and to evaluate their practices accurately to provide learners with effective instruction. If preservice teachers inaccurately plan, implement, and assess their instructional practices, they will not modify their practices, and cycles of ineffective instruction might remain. The purpose of the current convergent mixed methods study was to investigate (a) how preservice teachers provided evidence to support their self-reported metacognitive awareness scores and (b) how providing evidence influenced their metacognitive accuracy of intensive instruction. Seventeen preservice teachers completed two focus groups and self-report metacognitive awareness inventories. Quantitative and qualitative data were analyzed separately and then merged. The results revealed that, initially, the preservice teachers were inaccurate and overconfident in their metacognitive assessments. However, preservice teachers' metacognitive accuracy improved after being asked to provide evidence to support their self-ratings. Future research should continue to explore a variety of ways to improve preservice teachers' metacognitive accuracy.

Key Words: *metacognition, accuracy, overconfidence, mixed methods, and preservice teachers*

Introduction

Metacognition, metacognitive awareness, and metacognitive accuracy are important in the field of education. Teachers should be able to plan, to motivate, and to evaluate their practices to be effective. Furthermore, being aware of how they think about those practices and making changes to those practices are skills needed to increase effectiveness. Generally speaking, learners do not accurately assess their abilities to think about their use of skills or learning (Craig et al., 2020; Destan & Roebers, 2015); it begs the question as to whether preservice teachers (PSTs) also inaccurately think about their teaching practices. Although PSTs report high levels of metacognitive awareness (Abd-El-Khalick & Akerson, 2009; Asikcan & Saban, 2018; Hughes & Partida, 2020; Kozikoglu, 2019; Luke et al., 2021), this accuracy has not been studied, revealing a

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gap in the literature. Further investigations into how PSTs think about their instructional practices are needed; otherwise, researchers might wonder if PSTs are inaccurately assessing their instructional practices, will cycles of ineffective practices change? Preservice teachers who demonstrate accurate metacognitive awareness can intentionally modify their instruction to help students achieve target objectives (Yerdelen-Demar et al., 2015). Overall, improving PSTs' metacognitive accuracy increases their instructional effectiveness, thereby leading to improved student learning outcomes.

Literature Review

Metacognition

Researchers define *metacognition* as one's ability to be aware and in control of one's own learning (Flavell, 1979; Hughes & Partida, 2020). Metacognition includes planning, motivation, and evaluation strategies as well as cognitive and affective processes (Flavell, 1979; Karaoglan Yilmaz & Yilmaz, 2019). *Metacognitive awareness* occurs when one is aware of how they think, learn, and adjust behaviors to improve learning outcomes (Hughes & Partida, 2020; Louca, 2019). As a result of becoming more metacognitively aware, one improves their ability to plan, to monitor, and to control their learning processes by finding learning techniques that work best for them and becoming more autonomous and effective in their learning (Karaoglan Yilmaz & Yilmaz, 2019; Louca, 2019). Metacognitive awareness includes two components; knowledge and regulation. The knowledge component "consists of knowledge or beliefs that drive cognitive enterprises" (Balcikanli, 2011, p. 1312), whereas the "regulation component consists of actions that facilitate learning" (Balcikanli, 2011, p. 1317). Both the knowledge and regulation components of metacognitive awareness have three subdimensions; conditional, procedural, and declarative and planning, monitoring, and evaluating, respectively. The components and subdimensions of metacognitive awareness should be developed in all learners, especially PSTs about their content and instructional practices. Research has shown that PSTs can develop metacognitive awareness about their content (Adadan, 2020; Asikcan & Saban, 2018) and instructional practices (Hughes, 2017; Hughes & Partida, 2020; Lubin & Ge, 2012; Luke et al., 2021). Preservice teachers should learn the importance of metacognitive awareness because, as teachers, they will be in a unique position to promote students' metacognitive awareness of learning (Hughes & Partida, 2020).

Metacognition is a difficult topic to quantify (Cihanoglu, 2012); therefore, few instruments have been developed to focus specifically on metacognitive awareness. Schraw and Dennison (1994), for example, developed the Metacognitive Awareness Inventory (MAI). The MAI is a 52 item self-report instrument that assesses eight component processes within metacognitive knowledge and regulation: declarative knowledge, procedural knowledge, conditional knowledge, planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation. Balcikanli (2011) revised the MAI for use with preservice and inservice teachers (MAIT). Specifically, Balcikanli shortened the number of statements and slightly revised the MAI statements to encourage teachers to think about and be more aware of their instructional practices. Likewise, Cihanoglu (2012) developed the Metacognitive Awareness Scale (MAS) to assess PSTs'

metacognitive awareness. The MAS consists of 24 items under three dimensions; knowledge or awareness of self and strategies, cognitive and metacognitive strategies, and evaluation. Mokhtari and Reichard (2002) created the Metacognitive Awareness of Reading Strategies Inventory (MARSI) to assess 6th- to 12th-grade students' awareness of academic reading materials. Although the MAI, MAIT, MAS, and MARSI are valid and reliable self-report instruments for assessing metacognitive awareness (Balcikanli, 2011; Cihanoglu, 2012; Mokhtari & Reichard, 2002; Schraw & Dennison, 1994), none of them assess metacognitive accuracy.

Metacognitive Accuracy

Metacognitive accuracy is the ability to evaluate correctly one's knowledge and performance (Molenberghs et al., 2016). Research indicates that learners of all ages often are inaccurate and overconfident when assessing their metacognitive awareness (Craig et al., 2020; Destan & Roebers, 2015). Specifically, PSTs tend to report high levels of metacognitive awareness (Abd-El-Khalick & Akerson, 2009; Asikcan & Saban, 2018; Hughes & Partida, 2020; Kozikoglu, 2019; Luke et al., 2021), but it is unknown whether their self-reported metacognitive awareness is accurate or not. For example, Abd-El-Khalick and Akerson (2009) found that PSTs who did not have training were overestimating their metacognitive awareness. Furthermore, the group that did receive training only overestimated their metacognitive awareness on the initial pretest, suggesting that the training was effective in improving PSTs' accuracy. Likewise, Kozikoglu (2019) proposed that PSTs' metacognitive skills might have been overestimated only because they were self-reported and actual accuracy could not be assessed. When PSTs are over or underconfident in their ratings, they are metacognitively inefficient, and the inefficiency is an indicator that the learner has low metacognitive accuracy (Shekhar & Rahnev, 2021). Research on metacognitive awareness with students, teachers, and PSTs has been widely reported (Hughes, 2017; Hughes & Partida, 2020; Louca, 2019; Lubin & Ge, 2012; Luke et al., 2021; Vosniadou et al., 2021). However, research that explores whether PSTs are assessing their metacognitive awareness accurately is scarce and research that attempts to improve PST accuracy is lacking. Furthermore, there is no research that explores PSTs' metacognitive accuracy in relation to specific instructional practices, such as intensive instruction.

Intensive Instruction

Programs in teacher education have the difficult challenge of identifying the most critical aspects to teach preservice teachers, helping them acquire proficiency in what seems like a plethora of practices, strategies, methods, and approaches. The field of special education has addressed this need in teacher preparation by identifying broad, frequently used, and research-based practices applicable to a variety of disciplines and content areas called high-leverage practices (McLeskey et al., 2017). Out of 22 high-leverage practices, 13 are focused on instruction—including but not limited to using explicit instruction, scaffolding, flexible grouping, adapting tasks and materials, and intensive instruction. A broad definition of intensive instruction is "an approach to identifying academic and social behavior challenges and designing a system of support to address those needs

systematically" (Kearns et al., 2019, p. 279) Students requiring intensive instruction are students with identified disabilities or students who are struggling academically or behaviorally and receive support in a multi-tier support (MTS) or response-to-intervention (RTI) system. According to the National Center for Education Statistics (2022), 80% of students with disabilities spend approximately 60% of their school day in general education classrooms. Considering the time with disabilities and other various needs spent in general education classrooms, it is important for preservice teacher programs offering dual certification in both elementary and special education to address more individualized and intensive instructional practices that support students with more intensive needs in their curriculum. Although data-based individualization (DBI) is one popular way for providing intensive instruction in special education (Kearns et al., 2019), it is debatable whether teachers planning to teach in general education environments or resource rooms should be required to master a specialized approach such as DBI. However, the basic components of intensifying instruction are applicable to general education teachers including practices such as manipulating instruction dosage, decreasing group size, using explicit instruction, setting individualized learning objectives, and providing repeated practice opportunities paired with corrective feedback in a small group of students. All the foundational intensive instruction elements are pertinent for PSTs learning how to provide effective instruction to students with various academic and behavioral needs (Stevenson & Reed, 2017).

It is crucial for all individuals to understand the process of how one thinks as well as how one can complete a task and then adjust one's thinking or strategy to repeat the task (Schraw & Dennison, 1994). This is especially true for PSTs as they are learning how to implement instructional strategies, such as intensive instruction, in the classroom. Researchers determined that PSTs who apply metacognitive knowledge and regulation strategies can strategically and accurately identify, choose, implement, and adjust instruction to help students achieve target objectives (Yerdelen-Demar et al., 2015). Preservice teachers self-report high levels of metacognitive awareness (Asikcan & Saban, 2018; Hughes & Partida, 2020; Kozikoglu, 2019) but there is no evidence to support the accuracy of the PST's self-reported high levels of metacognitive awareness. Arguably, PSTs' inaccurate self-assessment of their metacognitive awareness could negatively impact their efforts to improve their instructional practices. Therefore, the current research study explored (a) how PSTs provided evidence to support their self-reported metacognitive awareness during intensive instruction practices and (b) how providing evidence influenced their metacognitive accuracy during the practice of intensive instruction.

Method

The current research study utilized a fixed mixed methods convergent design to investigate how the MAIT-E influenced teachers' metacognitive accuracy about intensive instruction. The researchers used a fixed mixed methods design because the quantitative and qualitative methods, procedures, and analyses were predetermined and planned at the beginning of the research process (Creswell & Plano Clark, 2018). A convergent typology was utilized in which both quantitative and qualitative data were analyzed separately and then converged to provide a deeper

understanding of the data (see Figure 1), which could be diminished if using only one research approach (Creswell & Plano Clark, 2018).

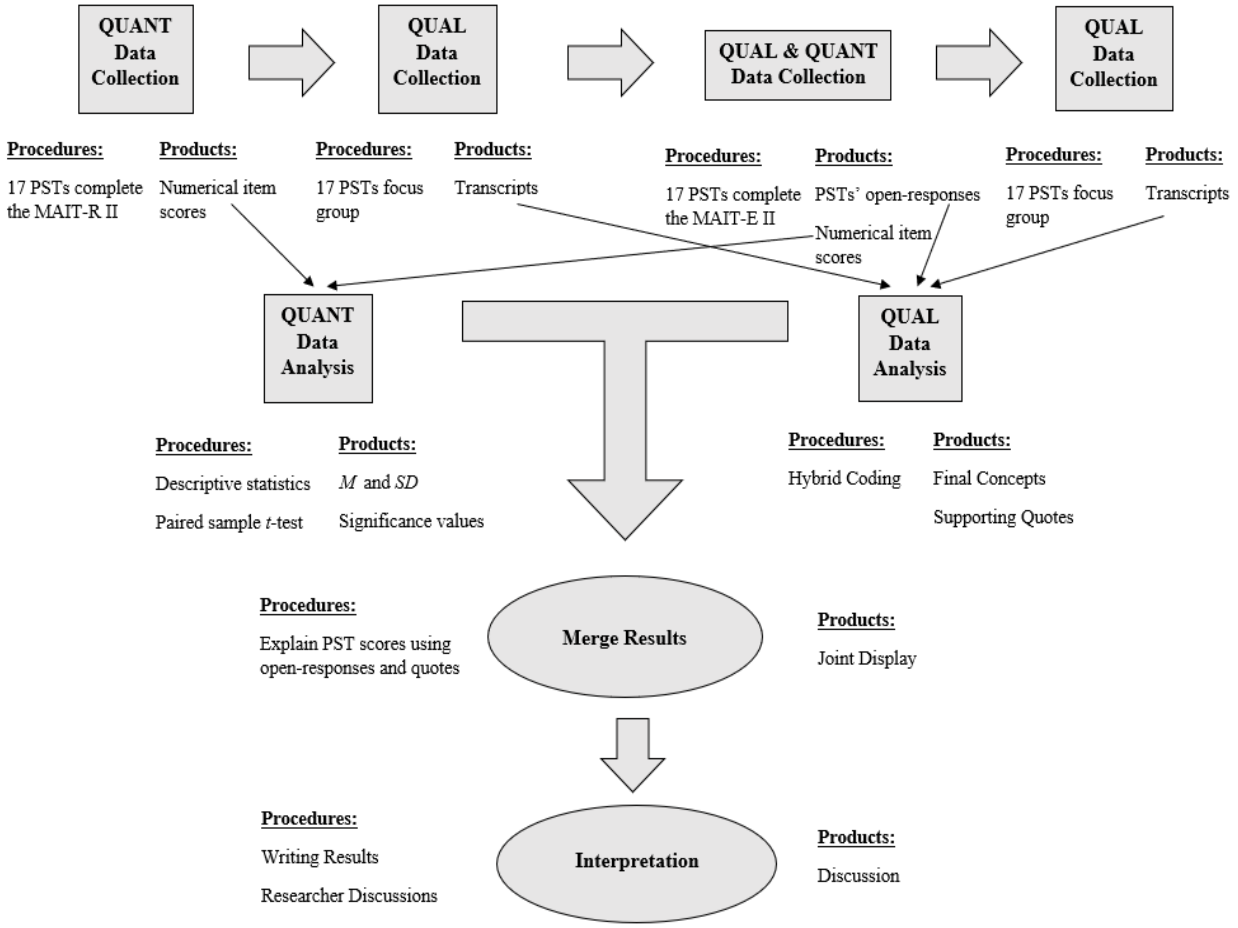

Fig. 1. *A Visual Representation Of The Fixed Mixed Methods Convergent Design Showing The Procedures and Products for Data Collection, Data Analysis, and Merging of the Data*

The overall design of this fixed mixed methods convergent study included both qualitative and quantitative data to explore how the MAIT-E II influenced PST's metacognitive accuracy. The qualitative data were collected from two focus group transcripts and 17 open responses from MAIT-E II. The data were analyzed based on Fereday and Muir-Cochrane's (2006) hybrid approach that combined the process of deductive thematic analysis while allowing for themes to emerge directly from the data using inductive coding. The predetermined codes used during deductive coding were based on the major components of metacognitive awareness: knowledge and regulation. Next, the inductive approach was used to identify emergent concepts from the data directly related to the research questions. The quantitative approach used a one-group, non-random pretest/posttest design. The data were collected from 17 PSTs' self-reported Likert-format scale responses on two metacognitive inventories. The researchers hypothesized that the PSTs would

become more metacognitively accurate in their self-reported metacognitive awareness scores after being asked to provide evidence for their responses on the metacognitive inventory.

Participants

The participants were 17 non-traditional PSTs enrolled in a teacher education program at a small southeastern private university. Non-traditional students are typically 21 years or older, have employment and family responsibilities, and might be financially independent (Gilardi & Guglielmetti, 2011). The PSTs were pursuing dual certification in both elementary and special education and were enrolled in a special education methods course. The participants were 94% women and 6% men and were 53% European American, 35% African American, and 12% Hispanic American. Most of the PSTs in the course were general education and special education paraprofessionals working in various K-5 schools in counties surrounding a metropolitan city. A few PSTs volunteered in schools and worked as a homemaker or office administrative assistant. Additionally, there were two special education teachers who were already teaching with a waiver for certification. Although the PSTs had general classroom experience with observing and facilitating small groups, their knowledge and use of intensive instructional practices were limited. For example, the PSTs working in schools had experiences observing and facilitating small group activities within the general education classroom environment with plans created by the teacher of record. However, the PST did not design the small group lessons nor intentionally use intensive instruction components such as repeated practice and corrective feedback. All participants provided informed consent to allow the researchers to use their data for analysis in the study. Data were de-identified after all the data had been collected, paired, and input into IBM SPSS Statistics (Version 28). Participants could have chosen not to allow use of their data for analysis; however, all participants still completed the MAIT-R II, MAIT-E II, and focus group discussions because the activities were a part of the regular instruction for the course.

Researchers' Descriptions

The research team consisted of three members. The primary researcher was trained in quantitative research methodology and conducted multiple research studies with PSTs and metacognition. The second researcher was the instructor for the course, trained in qualitative research methodology, and has conducted multiple research studies with PSTs and metacognition. Both researchers were instructors in a teacher education program at a small private university located in the southeast and had experience and training implementing metacognition in preservice teacher education programs. The third researcher was a doctoral student in Year 3 of a Ph.D. program focusing on curriculum and instruction and training in quantitative research methodology.

Data Sources

Metacognitive Awareness Inventory for Teachers-Revised Intensive Instruction

The Metacognitive Awareness Inventory for Teachers-Revised Intensive Instruction (MAIT-R II) is a self-report Likert-type inventory. The inventory contains 24 statements about intensive

instruction that, in turn, assess the two components of metacognitive awareness: knowledge and regulation. The PSTs were asked to read each statement and circle the number on a Likert-type scale (1 = strongly disagree, 5 = strongly agree) that best described them. Examples of knowledge and regulation statements are presented in Figure 2. The MAIT-R II was derived, with permission, from the original Metacognitive Awareness Inventory for Teachers (Balcikanli, 2011), which includes broad statements about teaching practices. The MAIT has been found to yield reliable and valid scores for use with teachers (Kallio et al., 2017) and preservice teachers (Balcikaanli, 2011). The MAIT-R II was revised to include specific statements about intensive instruction.

11. I find myself assessing how useful my strategies are while I am using intensive instruction.	1 2 3 4 5
12. I ask myself if I could have used different strategies after intensive instruction lessons.	1 2 3 4 5
13. I have control over how well I use intensive instruction.	1 2 3 4 5
14. I am aware of what strategies I use during intensive instruction.	1 2 3 4 5
15. I use different *intensive instruction* strategies depending on the situation.	1 2 3 4 5
16. I ask myself questions about the intensive instruction materials I am going to use.	1 2 3 4 5

Fig. 2 Examples of knowledge and regulation statements from the MAIT-R II

Metacognitive Awareness Inventory for Teachers-Evidence Intensive Instruction

The Metacognitive Awareness Inventory for Teachers-Evidence Intensive Instruction (MAIT-E II) is similar to the MAIT-R II because it has the exact same statements. However, the MAIT-E II has 24 additional open-response statements that encourage the PSTs to explain and/or to provide evidence for their self-reported scores (see Figure 3).

15a. I use different intensive instruction strategies in different situations by…	
15b. I use different intensive instruction strategies depending on the situation.	1 2 3 4 5
16a. When thinking about my intensive instruction materials, I ask myself questions like…	
16b. I ask myself questions about the intensive instruction materials I am going to use.	1 2 3 4 5

Fig. 3. *Examples of Knowledge and Regulation Statements from the* MAIT-E II

Focus Groups

Two focus groups were conducted as class discussions during synchronous zoom meetings. The focus groups were approximately 30 minutes long and recorded in Zoom. The instructor projected the focus group questions on a shared screen during the zoom class and asked each question to the whole class. The PSTs answered the questions posed by the instructor; however, no order was used for asking the questions and the PSTs were free to share their thoughts in addition to the questions. The questions asked during the first focus group were: What did you think about the MAIT? Did you feel knowledgeable enough to answer the questions, why or why not? What did you think when you saw the MAIT? Were you honest with yourself about your ratings? Was it difficult to rate yourself, why or why not? Did using the MAIT change your understanding of intensive instruction, how so? The second focus group consisted of questions about what PSTs were thinking about providing evidence for their ratings. Some examples of these questions were:

What did you think when you were asked to provide evidence for your rating? Were you able to provide evidence, why or why not? What were you feeling while you were providing evidence? Were you honest with yourself about your ratings after you provided evidence? How did you score yourself from the first time to the second time? Did using the MAIT-E change your understanding of intensive instruction, how so? The instructor downloaded the transcripts from Zoom, listened to them for accuracy, and changed anything inaccurately transcribed by Zoom.

Procedures

The study took place in a special education method blended format course for undergraduate PSTs. The course included synchronous Zoom, asynchronous, and face-to-face class meetings. The course duration was 8 weeks and the class met once a week for approximately four hours. The instructor supplied introductory literature about metacognition to the PSTs to read in preparation for the first class. During the first class, the instructor provided an explicit instruction lesson on metacognition. After the lecture, the PSTs completed the MAIT-R II and then engaged in a focus group discussion about the MAIT-R II. During the second class, the PSTs completed the MAIT-E II and then engaged in a focus group discussion about the MAIR-E II. The following notation represents the mixed methods data collection procedures:

$$\text{QUANT} \longrightarrow \text{QUAL} \longrightarrow \text{QUAL} + \text{QUANT} \longrightarrow \text{QUAL}$$

Data Analysis

Metacognitive Accuracy was calculated on the MAITs using a sum score ranging from 24 to 120. Scores that ranged from 24 to 60 were considered accurate scores and scores that ranged from 61 to 120 were considered overconfident scores for PSTs metacognition. The MAIT scores were dichotomized because preservice teachers with little to no experience using intensive instruction are expected to rate themselves lower because the knowledge required and experience with the practice of intensive instruction would be necessary for a higher rating. Furthermore, a higher score would be improbable because of the complexity of the specific practice of intensive instruction. The knowledge and regulation components also were calculated using sum scores ranging from 12 to 60. Scores that ranged from 12 to 30 were considered accurate scores, and scores that ranged from 31 to 60 were considered overconfident scores for PSTs metacognition.

Results

The qualitative and quantitative data were analyzed separately and then merged for integration and interpretation. The quantitative data were analyzed using three paired samples *t* tests. The qualitative data were analyzed using a hybrid approach. The merging of the data was presented as a joint display to show how both the quantitative and qualitative data were used to investigate PST metacognitive accuracy overall, as well as the knowledge and regulation components.

Metacognitive Accuracy

A paired samples *t* test was used to determine whether there was a statistically significant difference between the PSTs' sum scores on the MAIT-R II and the MAIT-E II overall. The results revealed a statistically significant differences between the two MAIT scores, $t = 7.52$, $p < .001$, Cohen's $d_z = 1.82$, suggesting a large effect. The PSTs' scores on the MAIT-R II were statistically significantly higher on the MAIT-R II ($M = 80.88$, $SD = 14.62$) than were the PSTs' scores on the MAIT-E II ($M = 54.18$, $SD = 19.12$) (see Figure 4). In fact, the PSTs' scores decreased by 33% on the MAIT-E II. The findings suggest that the PSTs were not accurately assessing their metacognitive awareness on the MAIT-R II and they were overconfident in their self-assessments. However, the MAIT-E II, which asked the PSTs to provide evidence for their self-assessment of the question, decreased the PSTs' self-reported metacognitive awareness, making them more accurate in their self-assessments.

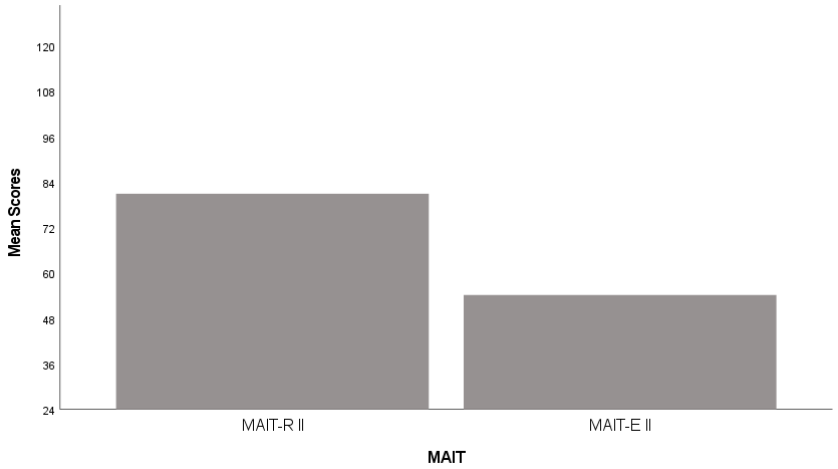

Fig. 4. *A Comparison of Preservice Teachers' Mean Scores on the MAIT-R II and MAIT-E II*

The quantitative data were supported by the qualitative data and expanded on the quantitative findings with explanations from the participants about their thinking after using both tools. The data revealed that (a) MAIT-R II increased the PSTs' metacognitive awareness, (b) the PSTs were inaccurate in their reporting of their metacognitive awareness, and (b) MAIT-E II made PSTs more accurate in self-assessing their metacognitive awareness.

First, PSTs stated that the MAIT-R II made them more aware of their teaching practices. Preservice teachers made statements such as, "[The MAIT-R II] made me think about the things that you naturally change to adapt to the type of students you're working with..." or, "I like it because it makes you more aware. It makes you think about teaching and how your strategies are and what you can do better..." Essentially, the MAIT-R II made the PSTs think differently about intensive instruction by drawing their attention to various aspects of using the practice (e.g., setting goals, using strategies) they had not previously considered.

Second, although PSTs shared that their thinking about intensive instruction changed, they described how they rated their metacognitive awareness without realizing it was inaccurate. For example, Participant 1 expressed, "I'm rating myself on the neutral lower side [rating 3] with a lot of the things but it's because whenever I learn it, [my rating] will slowly go up on the rating scale." Another PST working as a paraprofessional reported,

> I did neutral [rating 3] just because of my current role. I give instruction, but at the same time I don't give instruction. Right now, I'm kind of all over the place. I'm not in there long enough. I'm in there literally only enough for the teacher to give her lecture.

Both of the preceding examples illustrate how the PSTs thought about the rating of neutral as low when it was a 3 on a scale of 1 to 5.

Finally, PSTs acknowledged differences between rating themselves on the two different MAITs. Although many participants described completing the MAIT-R II as "confusing," "difficult," and "scary," they also maintained their confidence in their abilities to use intensive instruction. For example, one participant who had been a paraprofessional for 4 years stated the following:

> Even though I do work at a school, and I do a lot of small groups, it really made me kind of think, okay I'm doing a good job and I'm amazing, but what can I change or what can I use from [the MAIT-R II]?

After completing the MAIT-E II, many participants explained how their thinking about their practice had changed and they felt more unsure and as if they were second guessing themselves. Table 1 provides a comparison of several participants thinking about completing the MAIT-R II and then completing the MAIT-E II to illustrate the difference in their thinking between the tools.

Table 1

Example of Participants' Thinking on the MAIT-R II and MAIT-E II

	MAIT-R II	**MAIT-E II**
Participant 8	*I liked it. I thought it was a good way to really assess yourself and really think about how you are in the classroom. I felt confident about myself on questions that I know I do good at, but then, the ones I'm like "Oh I don't really know how I'm doing" kind of defeated me a little bit.*	*As I'm filling it out I see some questions and I'm like, "Oh I'm really good at this", but then others I'm like, "I think I'm good at this, but maybe I'm not." So, I'm left questioning, am I doing these things right? I'm wondering more than before* [completing] *that type of thing.*
Participant 16	*I like to do the rating on it because you can see your progress over a timeframe. So, say I'm a one in one area I'll go back in a couple of weeks from now, and I can see myself higher, and then just seeing growth is what I like to see in myself, so I do like that about the rating.*	*I realized I don't have enough experience to answer these questions yet. So that was really a difference from the first time.*
Participant 15	*I was really thinking about am I doing this, am I doing it well, and so it just really made me think about what I'm going to do tomorrow when I go to work. I'm going to start thinking about it just a little more.*	*It was kind of hard to self-assess everything because I don't think I know enough about it, yet to know whether or not I'm really using it, or if I'm using it effectively or anything like that.*

Participant 11	*I do small groups pretty much all day. We go through language arts, to math and then, if there is anything else in between, so it was easy to fill out because this is what I do every day. But it's also a good time to reflect and make sure that you are staying on top of what you need to do. I usually ask those questions more when something has just completely flopped.*	*For me it was making me second guess myself. I would read it then I am thinking one thing and then I was like "Well no, hold on, let me go back" and I just kept going back and forth trying to see if I really do it, or if I halfway do it... So, for me, it was just a lot of second-guessing.*

Note. Participants' quotes are italicized to illustrate their words

Knowledge

A paired samples *t* test was used to determine whether there was a statistically significant difference between the PSTs' MAIT-R II median scores and the MAIT-E II median scores for the knowledge statements only. Findings revealed a statistically significant difference between the two MAIT scores and the knowledge statements, $t = 5.26$, $p < .001$, Cohen's $d_z = 1.28$. The PSTs' scores on the MAIT-R II knowledge statements were statistically significantly higher ($M = 37.88$, $SD = 7.02$) than were the PSTs' scores on the MAIT-E II knowledge statements ($M = 27.41$, $SD = 10.03$). The PSTs' scores decreased by 28% on the MAIT-E II. The findings suggest that the PSTs were not accurately assessing their knowledge of intensive instruction on the MAIT-R II and they were overconfident in their self-assessments. When the PSTs were asked to provide evidence of their knowledge of intensive instruction on the MAIT-E II, they decreased their self-reported metacognitive knowledge making them more accurate in their self-assessment.

Qualitatively, PSTs answered questions and responded to statements about their knowledge of intensive instruction including what it was, when to use it, and how to use it. After completing the MAIT-R II, the PSTs described their knowledge of intensive instruction as being "sufficient" for doing their job but acknowledged their need for improvement. Furthermore, they recounted their past and current classroom experiences (e.g., teaching small groups, working with students in one-on-one settings, etc.) as evidence of their knowledge without providing specific examples of what, when, and how they would use intensive instruction. For example, one PST who worked in a preschool narrated,

> You've got this great lesson, and you know just what to do. You've got everything you need and then you're doing it and then they look at you and it's just crickets. It's just like they have no clue, and you have no clue what went wrong.

Her experience in a classroom gave her confidence that she had the knowledge she needed to teach a lesson because she "knew just what to do," but her explanation illustrated her lack of knowledge when stating "you have no clue what went wrong." Interestingly, most of the PSTs believed that they had adequate knowledge of intensive instruction after completing the MAIT-R II because of their school experiences as paraprofessionals or preschool teachers but their responses about intensive instruction revealed a lack of knowledge.

After completing the MAIT-E II, PSTs' responses were categorized as "do not know" or "broadly related to teaching." To begin, PSTs used phrases such as "I don't know" or "I am unsure" to describe their knowledge of intensive instruction. For example, one PST stated, "I realized I scored differently because I don't know much about intensive instruction and haven't been using it to teach. The MAIT-E II made me more aware of what I don't know." Another PST revealed, "It was kind of hard to self-assess everything because I don't think [I] know enough about it yet to know whether or not I'm really using it or if I'm using it effectively." Overall, having to answer questions and to provide evidence for their rating on the MAIT-E II increased the PSTs' awareness that they did not have specific knowledge about intensive instruction.

Additionally, PSTs provided more examples of what they knew about using intensive instruction; however, their responses were broad and related to common teaching characteristics rather than specific intensive instruction skills. For example, PSTs identified the most important intensive instruction skills as being clear, concise, modeling, organizing, following correct steps, and pacing. These are general characteristics that could be used to talk about any teaching practice. Another example of the PSTs' lack of specificity of knowledge was illustrated by a participant who stated, "I just know, I just can't say it." Overall, PSTs either recognized their lack of knowledge about intensive instruction by stating that they did not know or responded to statements or questions using general teaching terms that could be applied to any teaching practice. Both types of responses pointed to their incomplete knowledge of what intensive instruction was, when to use it, and how to use it.

Regulation

A paired samples *t* test was used to determine whether there was a statistically significant difference between the PSTs' MAIT-R II mean scores and the MAIT-E II mean scores for the regulation statements only. The results revealed a statistically significant difference between the two MAIT scores and the regulation statements, $t = 7.80$, $p < .001$, Cohen's $d_z = 1.89$. The PSTs' scores on the MAIT-R II regulation statements were statistically significantly higher ($M = 42.41$, $SD = 8.63$) than were the PSTs' scores on the MAIT-E II regulation statements ($M = 26.88$, $SD = 9.60$). The PSTs' scores decreased by almost 37% on the MAIT-E II. The findings suggest that the PSTs were not accurately assessing their regulation of intensive instruction on the MAIT-R II and they were overconfident in their self-assessments. When the PSTs were asked to provide evidence of how they regulated intensive instruction on the MAIT-E II, they decreased their self-reported metacognitive regulation, making them more accurate in their self-assessment. Figure 5 compares the mean scores of the knowledge and regulation components on both the MAIT-R II and the MAIT-E II.

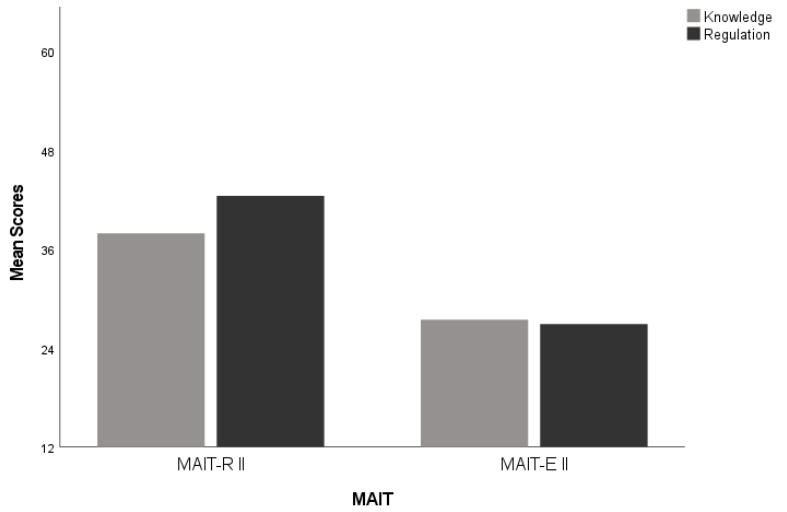

Fig. 5 A comparison of preservice teachers' mean scores on the MAIT-R II and MAIT-E II by knowledge and regulation components

Qualitatively, PSTs answered questions and responded to statements about their regulation of the practice of intensive instruction that included planning for it, monitoring their teaching while using it, and evaluating themselves after using it. After completing the MAIT-R II, the PSTs' responses about regulating their use of intensive instruction were general statements about their abilities to "teach small groups," "just do it," or "give instruction." None of the PSTs talked specifically about planning, monitoring, or evaluating their use of intensive instruction but two PSTs mentioned asking questions about their use of intensive instruction after a lesson went poorly. For example, one PST explained,

> I do small groups pretty much all day. We go through language arts, to math and then, if there is anything else in between, so it was easy to fill out because this is what I do every day. But it's also a good time to reflect and make sure that you are staying on top of what you need to do. I usually ask those questions more when something has just completely flopped.

Although most of the PSTs talked about their use of intensive instruction in general terms, only two of them mentioned asking themselves questions (evaluating) about their instruction after the lesson; however, they did not share what questions they asked.

After completing the MAIT-E II, PSTs explained how their thinking about how they use intensive instruction had changed. The PSTs thought having to provide evidence for their ratings was difficult because they thought teaching was something they just did, not something they had to think about. One PST explained,

> I don't know if I'm actually self-assessing the right way because I don't really know a lot about intensive instruction and it's hard to do. I've always just learned as future educators we all have a gift to teach but we don't really think about the extra things that we have to think about in teaching.

Another PST concluded, "When I completed it, I realized I don't have enough experience to answer these questions yet. So that was really a difference from the first."

Furthermore, the PSTs provided examples of how they plan, monitor, and evaluate their use of intensive instruction and their responses demonstrated a connection between their lack of knowledge and their inability to explain how they regulate their practice. For example, when asked to provide evidence of how they assess their strategies *while* teaching, the PSTs' responses included (a) if students can use the strategy more than once, (b) if students can complete work independently, (b) if students comprehend the material, and (d) exit tickets. These general responses indicated a lack of knowledge about how intentionally to regulate their use of intensive instruction.

Merging of Data

The quantitative and qualitative data were merged for further analysis. The columns in Table 2 represent PSTs' self-reported scores and example responses on the MAITs overall and by each component: knowledge and regulation. All the PSTs' responses were categorized as no response/do not know, inapplicable, or applicable. No response/do not know indicated that the response section was left blank or the response indicated that the PST did not know how to respond to the question. Inapplicable was used to categorize PSTs' responses that were provided but did not have an obvious connection to the MAIT statement. Applicable was used to categorize responses that were relevant to or provided evidence that supported the statement provided. Lastly, frequency counts were totaled to determine the number of PSTs' responses within each of the no-response, inapplicable, and applicable categories. The frequency counts also were converted to percentages for convenient interpretation.

Table 2
Joint Display of Quantitative and Qualitative Data Integration

	Overall	**Knowledge**	**Regulation**
MAIT-R II Total	80.88	37.88	42.41
MAIT-E II Total	54.18	27.41	26.88
***p*-value**	.001***	.001***	.001***
MAIT Example Statements	**I am aware of the strengths and weaknesses when using intensive instruction.**	**I know what skills are most important in order to be a good teacher of intensive instruction.**	**I find myself assessing how useful my strategies are while using intensive instruction.**
No Response/Do not Know	*I don't have much experience with intensive instruction, so I am not aware of my strengths and weaknesses.*	*I'm not sure.*	*I have not had a chance to use strategies yet- don't know.*
Frequency Count, %	227/408, 56%	108/204, 53%	119/204, 58%

Table Continued:

	Overall	**Knowledge**	**Regulation**
MAIT-R II Total	80.88	37.88	42.41
MAIT-E II Total	54.18	27.41	26.88
***p*-value**	.001***	.001***	.001***
Inapplicable	*I get frustrated sometimes when I have dotted all the i's and crossed my t's and the kids are looking at me with blank stares.*	*I know these skills are most important to be a good teacher: patience, understanding, gentleness, compassion, flexibility, and dedication.*	*I have a daily progress report that the teachers filled out.*
Frequency Count, %	6/408, 1%	3/204, 1%	3/204, 1%
Applicable	*I am aware of my strengths which are monitoring students for data and providing opportunities for feedback and my weaknesses are pacing and using explicit language during lessons.*	*The skills needed to be a good teacher are time management, using specific vocabulary, allowing time for students to respond, thinking out loud, and guiding students through practice.*	*By asking questions during the lesson.*
Frequency Count, %	175/408, 43%	93/204, 46%	82/204, 40%

Note. Participants' quotations are italicized to illustrate their words; *** $p < .001$

Both the qualitative data and quantitative data supported the researchers' beliefs that the PSTs were inaccurate and overconfident in self-reporting their metacognitive awareness. Furthermore, and as expected, asking the PSTs to provide evidence for each of the questions on the MAIT-E II decreased their self-reported scores of metacognitive awareness as many of the PSTs did not provide any applicable rationale or evidence to explain 57% of the statements. Asking the PSTs to provide evidence, thereby making them more aware of what they know and do not know and what they do and do not do when engaging in intensive instruction, increased their metacognitive accuracy.

Discussion

The current research study investigated the topic of PSTs' metacognitive accuracy, a topic with little to no literature among preservice teachers. There is plenty of literature that investigates PSTs' metacognitive awareness (Adadan, 2020; Asikcan & Saban, 2018; Hughes & Partida, 2020; Kozikoglu, 2019; Luke et al., 2021), as well as literature that identifies PSTs overconfidence (Asikcan & Saban, 2018; Kozikoglu, 2019; Vosniadou et al., 2021), but none that explored PSTs accuracy when self-assessing their metacognitive awareness. It is known that metacognition can be difficult to assess (Cihanoglu, 2012; Craig et al., 2020; Luke et al., 2021) and that metacognitive awareness can be taught and learned (Adadan & Oner, 2018; Hughes & Partida, 2020; Kallio et al., 2021; Luke et al., 2021). However, metacognitive awareness is not very informative if it is not accurately assessed. Therefore, based on the literature, the researchers attempted to use a tool effectively to help PSTs become more metacognitively accurate. The purpose of the current mixed methods research study was to investigate using the MAIT as a tool to explore (a) how PSTs provided evidence to support their self-reported metacognitive awareness scores and (b) how providing evidence influenced their metacognitive accuracy of intensive instruction.

Preservice Teachers' Evidence of Metacognitive Awareness

Preservice teachers struggled to provide evidence to support their metacognitive awareness. Although the PSTs were able to provide some applicable responses to their knowledge and regulation statements, many of the responses to the knowledge questions were what they *do* (regulation responses), as opposed to what they *know* (knowledge), about intensive instruction. It is important that PSTs can distinguish between *knowing* and *doing* involving instructional practices because if they do not know the practice, it is improbable that they can implement the practice intentionally and effectively. Hughes and Partida (2020) found that providing specific professional development was effective in influencing PSTs' metacognitive awareness. Perhaps preservice teachers could be provided more specific instruction and multiple opportunities to become aware of and distinguish between what they know and what they do.

Additionally, the PSTs' responses to the regulation statements involving evaluation were broad and general; responses that could be provided for any teaching practice. General evaluation of instructional practices is common in teacher education programs (Kallio et al., 2021; Vosniadou et al., 2021) but does not require preservice teachers to think deeply about the practice and particular aspects of the practice (e.g., intensive instruction). For example, Adadan (2020) found that metacognitive awareness influenced preservice chemistry teachers' understanding of gas behavior. He found the more metacognitively aware a preservice chemistry teacher was, the deeper their understanding of chemistry concepts. Preservice teachers need to think intentionally and specifically about the instructional practices they are learning in their teacher education programs.

Furthermore, the PSTs' evaluation responses were directed towards K-12 students' understanding and learning of the content, external goals, and outcomes, rather than their own teaching of the content, internal goals, and outcomes. Research has shown that teachers who are externally

motivated have low metacognitive awareness and adjust their instruction based on external factors (e.g., feedback, students), but teachers who are internally motivated have high metacognitive awareness and adjust their instruction based on self-evaluations (Adadan & Oner, 2018). This claim supports our results because the PSTs' responses were external, directed towards students and not themselves, suggesting that they had low metacognitive awareness and, therefore, were inaccurate in their self-reports on the MAITs. Preservice teachers need to look critically at their own teaching practices to determine the effectiveness of their instruction, as student outcomes do not inform the teacher *how, when, why,* and *where* to revise their instructional practices.

Preservice Teachers' Metacognitive Accuracy

Although the research supports evidence of PSTs self-reporting of high levels of metacognitive awareness (Abd-El-Khalick & Akerson, 2009; Asikcan & Saban, 2018; Hughes & Partida, 2020; Kozikoglu, 2019; Luke et al., 2021), the accuracy is unknown. Preservice teachers' metacognitive accuracy and research about how to make PSTs' self-reports more accurate is a gap in the literature. The findings from this current study offer several important contributions to the literature. Preservice teachers providing evidence to support their ratings influenced their metacognitive accuracy of intensive instruction.

When the PSTs were asked to provide evidence for their ratings, they experienced a disconnect between what they could explain and what they thought they knew. For example, PSTs stated that they knew how to do intensive instruction because they did it on a "daily basis," but when asked to explain it they stated they could not put it into words. The PSTs made strong statements about their knowledge and abilities, but when asked to provide more specific evidence of what they knew about intensive instruction or how to use it, they were confused because they could not.

Moreover, PSTs were inaccurate and overconfident in assessing their metacognitive awareness. An example of this was when they talked about rating themselves as a 3 out of 5 but explained they did not know much about the practice of intensive instruction or how to do it. Ideally, if PSTs did not know much about the practice or how to do it, they would rate themselves a 1. When the PSTs were not accountable for their self-reported scores on the first MAIT, they rated themselves higher. However, when accountability was a factor and they had to provide evidence and examples to support their responses, the PSTs reported lower scores, resulting in more accuracy in their self-reported ratings. Essentially, PSTs were initially overconfident, they became more accurate, thereby becoming more aware of their actual knowledge and regulation of intensive instruction.

Limitations and Future Research

This study has some limitations that should be addressed. The first limitation is related to Likert-type scales and central tendency bias—in which most people score around the center (Craig et al., 2020). Also, there might have been a discrepancy between the PSTs' and the researchers' understanding of what a 1, 3, or 5 on the Likert-type scale represented. Thus, explicit descriptions by the researchers to future participants about the values on the Likert-type scale as to what each

value would represent could help solidify future studies. The small sample size, although common in applied research, provides a limitation because the sample was not large or diverse enough to make broad generalizations (Adadan & Oner, 2018). Future studies could look at a larger population in the same university or even expand to other universities in the region or nation to see if the trends found in this study are found as the number of participants grows. A third limitation to this study involves the PSTs' personal characteristics (Destan & Roebers, 2015) including motivation, willingness to reveal oneself and be vulnerable, self-esteem, and social desirability bias (Craig et al., 2020). Perhaps PSTs struggled to rate themselves accurately because they did not want to make themselves feel bad by having to admit what they did not know. Future studies could explore other variables (e.g., confidence, self-efficacy, motivation) to understand how other variables might influence PSTs metacognitive accuracy.

Future research also could be expanded in ways not related to limitations. Researchers could provide PSTs multiple opportunities (Dalinger et al., 2020; Luke et al., 2021; Ward et al., 2018) to self-assess using the MAIT-E. Additionally, comparing PSTs metacognitive self-assessments over time and how their accuracy changes as they practice self-assessing their metacognitive awareness would be interesting. Another avenue of future research could use a qualitative research approach, such as conducting interviews with PSTs (Lubin & Ge, 2012), to probe deeper into PSTs' understanding of their metacognitive accuracy and potential overconfidence.

Conclusion

Overall, although PSTs were inaccurate in their initial self-reported ratings on the MAIT-R II, reading and completing both MAITs did make them think more deeply about the practice of intensive instruction. The MAIT statements drew the PSTs' attention to specific aspects of intensive instruction (e.g., goals, strategies, pacing, skills, motivation, effectiveness); a practice in which they might not have otherwise engaged. Suggesting that, at the very least, asking PSTs to think more deeply about the *whats*, *whens*, *whys*, and *hows* of specific teaching practices can help them begin to develop metacognitive awareness. Further and explicit PST training programs are needed so that PSTs are equipped to develop their thinking about knowing and using teaching practices more intentionally.

The current research study sought to fill a gap in the literature to improve PSTs' metacognitive accuracy because both metacognitive awareness *and* accuracy are important in the field of education. Teaching is a complex task requiring teachers to navigate subject matter, instructional practices, and student learning. In order to prepare PSTs for such a demanding profession, they need to not only be aware of what they know and do not know (knowledge) as well as what they do and do not do (regulation), but also be accurate in their self-assessments of knowledge and regulation. Preservice teachers' improved metacognitive accuracy will allow them to modify better their use of instructional practices such as intensive instruction for effective student learning.

References

Abd-El-Khalick, F., & Akerson, V. (2009). The influence of metacognitive training on preservice elementary teachers' conceptions of nature of science. *International Journal of Science Education, 31*(16), 2161–2184. https://doi.org/10.1080/09500690802563324

Adadan, E. (2020). Analyzing the role of metacognitive awareness in preservice chemistry teachers' understanding of gas behavior in a metarepresentational instruction setting. *Journal of Research in Science Teaching, 57*(2), 253–278. https://doi.org/10.1002/tea.21589

Adadan, E., & Oner, D. (2018). Examining preservice teachers' reflective thinking skills in the context of web-based portfolios: The role of metacognitive awareness. *Australian Journal of Teacher Education, 43*(11), 26–50. http://dx.doi.org/10.14221/ajte.2018v43n11.2

Asikcan, M., & Saban, A. (2018). Prospective teachers' metacognitive awareness levels of reading strategies. *Journal of Educational Sciences 13*(1), 23–30. https://un-pub.eu/ojs/index.php/cjes/article/view/3366

Balcikanli, C. (2011). Metacognitive awareness inventory for teachers (MAIT). *Electronic Journal of Research in Educational Psychology, 9*(3), 1309–1332. https://doi.org/10.25115/ejrep.v9i25.1620

Cihanoglu, M. O. (2012). Metacognitive awareness of teacher candidates. *Social and Behavioral Sciences, 46*, 4529–4533. https://doi.org/10.1016/j.sbspro.2012.06.290

Craig, K., Hale, D., Grainger, C., & Stewart, M. E. (2020). Evaluating metacognitive self-reports: Systematic reviews of the value of self-report in metacognitive research. *Metacognition and Learning, 15*, 155–213. https://doi.org/10.1007/s11409-020-09222-y

Creswell, J. W. & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research*. (3rd ed.). Sage.

Dalinger, T., Thomas, K. B., Stansberry, S., & Xiu, Y. (2020). A mixed reality simulation offers strategic practice for pre-service teachers. *Computers and Education, 144*, 1–15. https://doi.org/10.1016/j.compedu.2019.103696

Destan, N., & Roebers, C. M. (2015). What are the metacognitive costs of young children's overconfidence? *Metacognition and Learning, 10*, 347–374. https://doi.org/10.1007/s11409-014-9133-z

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*(1), 80–92.

Flavell, J. H. (1979). Metacognition and cognitive monitoring. *American Psychologist, 34*, 906–911. https://doi.org/10.1037/0003-066X.34.10.906

Gilardi, S., & Guglielmetti, C. (2011). University life of non-traditional students: Engagement styles and impact on attrition. *Journal of Higher Education, 82*(1), 33–53. https://doi.org/10.1080/00221546.2011.11779084

Hughes, A. J. (2017). Educational complexity and professional development: Teachers' need for metacognitive awareness. *Journal of Technology Education, 29*(1), 25–44. https://doi.org/10.21061/jte.v29i1.a.2

Hughes, A. J., & Partida, E. (2020). Promoting preservice STEM education teachers' metacognitive awareness: Professional development designed to improve teacher metacognitive awareness. *Journal of Technology Education, 32*(1), 5–20. https://doi.org/10.21061/jte.v32i1.a.1

Kallio, H., Kallio, M., Virta, K., Iiskala, T., & Hotulaninen, R. (2021). Teachers' support for learners' metacognitive awareness. *Scandinavian Journal of Educational Research, 65*(5), 802–818. https://doi.org/10.1080/00313831.2020.1755358

Karaoglan Yilmaz, F. G., & Yilmaz, R. (2019). Impact of pedagogic agent-mediated metacognitive support towards increasing task and group awareness in CSCL. *Computers and Education, 134*, 1–14. https://doi.org/10.1016/j.compedu.2019.02.001

Kearns, D., Pollack, M., & Whaley, V. (2019). High leverage practices for inclusive classrooms. In J. McLeskey, L. Maheady, B. Billingsley, M. T. Brownell, & T. J. Lewis (Eds.), *Provide intensive instruction* (pp. 279-301). Routledge.

Kozikoglu, I. (2019). Investigating critical thinking in prospective teachers: Metacognitive skills, problem solving skills and academic self-efficacy. *Journal of Social Studies Education Research, 10*(2), 111–130. https://jsser.org/index.php/jsser/article/view/362

Louca, E. P. (2019). Do children know what they know? Metacognitive awareness in preschool children. *New Ideas in Psychology, 54*, 56-62. https://doi.org/10.1016/j.newideapsych.2019.01.005

Lubin, I. A., & Ge, X. (2012). Investigating the influences of a LEAPS model on preservice teachers' problem solving, metacognition, and motivation in an educational technology course. *Education Technology Research and Development, 60*(2), 239–270. https://doi.org/10.1007/s11423-011-9224-3

Luke, S. E., Ford, D., Vaughn, M., & Fulchini-Scruggs, A. (2021). Using mixed reality simulation and roleplay to develop preservice teachers' metacognitive awareness. *Journal of Technology and Teacher Education, 29*(3), 389–413.

McLeskey, J., Barringer, M.-D., Billingsley, B., Brownell, M., Jackson, D., Kennedy, M., … Ziegler, D. (2017). *High-leverage practices in special education.* Council for Exceptional Children and CEEDAR Center.

Mokhtari, K. & Reichard, C. A. (2002). Assessing students' metacognitive awareness of reading strategies. *Journal of Educational Psychology, 94*(2), 249–259. https://doi.org/10.1037//0022-0663.94.2.249

Molenberghs, P., Trautwein, F. M., Böckler, A., Singer, T., & Kanske, P. (2016). Neural correlates of metacognitive ability and of feeling confident: A large-scale fMRI study. *Social Cognitive and Affective Neuroscience, 11*(12), 1942–1951. https://doi.org/10.1093/scan/nsw093

National Center for Education Statistics. (2022). *Students with disabilities. Condition of education.* U.S. Department of Education, Institute of Education Sciences. https://nces.ed.gov/programs/coe/indicator/cgg

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19,* 460–475. https://doi.org/10.1006/ceps.1994.1033

Shekhar, M., & Rahnev, D. (2021). Sources of metacognitive inefficiency. *Trends in Cognitive Sciences, 25*(1), 12-23. https://doi.org/10.1016/j.tics.2020.10.007

Stevenson, N. A., & Reed, D. K. (2017). To change the things I can: Making instruction more intensive. *Intervention in School and Clinic, 53*(2), 74–80. https://doi.org/10.1177/1053451217693365

Vosniadou, S., Darmawan, I., Lawson, M. J., Van Deur, P., Jeffries, D., & Wyra, M. (2021). Beliefs about the self-regulation of learning predict cognitive and metacognitive strategies and academic performance in pre-service teachers. *Metacognition and Learning, 16*(3), 523-554. https://doi.org/10.1007/s11409-020-09258-0

Ward, P., Chen, Y. J., Higginson, K., & Xie, X. (2018). Teaching rehearsals and repeated teaching: Practice-based physical education teacher education pedagogies. *Journal of Physical Education, Recreation and Dance, 89*(6), 20–25. https://doi.org/10.1080/07303084.2018.1476937

Yerdelen-Damar, S., Özdemir, Ö. F., & Ünal, C. (2015). Pre-service physics teachers' metacognitive knowledge about their instructional practices. *Eurasia Journal of Mathematics, Science and Technology Education, 11*(5), 1009–1026. https://doi.org/10.12973/eurasia.2015.1370a