Thinking About Thinking in Criminal Justice Education

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Metacognitive learning techniques encourage students to engage course material in such a way that facilitates learning, retention, and application of information gained from a course. While metacognition has begun to be widely used in higher education, little is known about its applicability to criminal justice education. Using a sample of undergraduate students from core criminal justice major courses, this study assesses the impact of metacognitive exercises on learning for criminal justice majors. Specifically, we compared the effect of implementing metacognitive activities on objective and subjective measures of student learning. The results of our evaluation revealed that metacognitive learning techniques were found to have varied objective effectiveness while simultaneously having consistent subjective effectiveness.

Introduction

Metacognition is the awareness and understanding of one's own thought processes. While metacognition may sound like a buzzword or unapproachable concept only contemplated in distant ivory towers, it is something we all engage in on a daily basis. Due to both its commonplace and academic functions, metacognition is a source of interest for scholars across the curriculum, including clinical psychology, education, and writing studies. Such fascination is due to the fact that students must become metacognitive thinkers in order to become self-directed learners (Ambrose, Bridges, DiPietro, & Lovett, 2010). As Ambrose et al. (2010) explained, self-directed learners "assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed" (p. 191). Therefore, integrated metacognitive activities help students to develop qualities that are consistently viewed as valuable and necessary in any profession.

Metacognition is often described simply as "thinking about thinking," but it involves complex processes that hold the potential of a more dynamic and flexible understanding of one's self as a thinker and a learner (Meichenbaum, 1985). Both the process of metacognition and the production of metacognitive

thinkers should be important components of the cognitive development and intellectual maturity of criminal justice students. A common distinction in metacognition separates metacognitive knowledge from metacognitive skills. *Metacognitive knowledge* refers to one's declarative knowledge about the interactions between people, tasks, and strategy characteristics while *metacognitive skills* refers to one's procedural knowledge for regulating problem-solving and learning activities (Flavell, 1981).

Managing one's learning processes is a major intellectual challenge students face when entering college and beyond (Pascarella & Terenzini, 2005) as it requires a more nuanced understanding of yourself as a thinker. Improving metacognition involves practicing skills that include assessing the demands of a task, evaluating one's own knowledge and skills, planning an approach, monitoring one's progress, and adjusting strategies as needed (Meichenbaum, 1985). An instructor's teaching and prompting of metacognition is important because students are often unaware of when and even what they have learned until they are prompted (Jarrott et al., 2008). Working to improve such knowledge can benefit learning and intellectual habits across the curriculum while also preparing learners to be a more nimble thinker within the discipline (Desautel, 2009).

Research indicates that explicit teaching of metacognitive skills can improve students' thinking skills—including those involved in reading, writing, and math (Desoete, Roeyers, & De Clercq, 2003; Pugalee, 2001). Developing learners' metacognitive skills can also help students select appropriate cognitive tools for certain tasks, encourage self-directed learning, and support learning overall. The significance and benefits of a metacognition seem obvious. Unfortunately, because teaching metacognition does not neatly fit into the content area or curriculum of most courses, it is often not addressed in classroom instruction (Pascarella & Terenzini, 2005).

Components of Metacognition

Metacognition has three main components: metamemory, metacomprehension, and self-regulation. As learners develop these skills, they begin to develop healthy intellectual knowledge and habits that improve academic performance along with their effectiveness as learners.

Metamemory refers to one's awareness and knowledge of their own memory systems and strategies for using their memories effectively (Brown, 1975; Flavell & Wellman, 1977). Rather than being connected to factors like intelligence or cognitive functions, metamemory is developed through experience, modeling, feedback, and reflection. This kind of information includes knowledge of different memory strategies, awareness of which strategies to use for different tasks, and the ability to use certain strategies. For example, to recall a list of certain terms, a learner would need to know that a category-grouping strategy may be effective along with how to use the strategy.

Metacomprehension involves a learner's awareness of and conscious control over one's own understanding or lack of understanding or comprehension (Brown, 1975). In other words, a learner can be considered aware and consciously in control not only if they know something but if they also know the best way they can learn it as well. For a learner to engage in this process, they must both recognize their failure to comprehend something and employ a strategy to repair comprehension once that failure is recognized (Flavell, 1981). For example, while reading a difficult text, a learner may detect inconsistencies like informational confusions or unclear references and then utilize strategies like re-reading or relating the text to prior knowledge to facilitate comprehension. Regardless of whether or not a student is earning high grades or performing well in other systems of evaluation, they may not be aware of their degree of understanding. A learner may think they are knowledgeable on a topic because they can mimic the language used or content discussed in class but fail to realize that they are not able to discuss it in more detail or apply it in a different context. This would be a case where one mistakes surface knowledge for deeper understanding.

Self-regulation refers to ongoing metacognitive adjustments of one's own learning or knowledge in response to feedback provided and where they are in the process of learning (Brown, Bransford, Ferrara, & Campione, 1983). It is a proactive process that students use to acquire academic skills. Definitions of self-regulated learning include three features: the use of self-regulated learning strategies, responsiveness to self-oriented feedback of learning effectiveness, and an interdependent motivational process (Biemiller & Meichenbaum, 1992). While all learners use some kind of self-regulation process to some extent, self-regulated learners are distinguished by two key factors: (1) They are aware of the strategic relations between regulatory processes and learning outcomes and (2) They use these strategies to achieve academic goals (Zimmerman, 1989). A student's effort to regulate their own learning involves three factors: personal processes, the environment, and one's behavior (Zimmerman, 1990). Self-regulated learners consider these factors and are able to assess the demands of the task, evaluate their own skill and knowledge, plan their approach, monitor progress, and adjust their strategies as needed in an ongoing and cyclical manner (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010). In the classroom, these actions could include strategies like student agency or clarifying purpose. Modeling self-regulation processes, like those associated with metamemory or metacomprehension, and asking learners to do the same can promote eventual adaptation of those processes for the learner's own use (Miller, 1985; Reeve & Brown, 1984).

Metacognition in the Classroom

When the skills to engage these processes are developed and supported, learners not only ascertain intellectual habits that improve both their performance

and effectiveness as learners (Pintrich, 1990), but they can also become self-directed learners. Self-directed learning becomes more important as an individual moves through higher education and into the real world as they are expected to take on more responsibility for managing their learning and understanding independently (rather relying upon the teacher to explicitly teach the material and check for understanding). In the classroom, instructors can teach and model metacognitive strategies and knowledge in order to help prepare students for more complicated or demanding tasks and content (Table 1).

Exploration and development of metacognitive knowledge can help inform the strategies students use in the classroom and, therefore, their learning (Ambrose et al., 2010).

Metacognition plays a crucial role in effective teaching. As research has shown, experienced and effective teachers plan, present, and evaluate hypotheses about their students while also reflecting metacognitively on their own thinking and teaching processes (Cochran-Smith & Lytle, 1999). Such research indicates that a teacher's knowledge about themselves, including knowledge of self-schemas and metacognitive knowledge of personal variables,

Table 1 Teaching and modeling metacognition

Metacognitive strategy or knowledge	Explanation of teaching strategies
Monitoring thinking processes	Teachers have to model self-monitoring of thinking processes to assist students in developing their own thinking processes (Gourgey, 1998). For instance, teachers might perform a task and reflect on it aloud so students can observe the process
Self-selecting metacognitive strategies	Teachers assist students in learning how to select their own metacognitve strategies. Students who self-select strategies are more successful than those who adopt teacher-imposed strategies
Internalizing self-monitoring techniques	Teacher uses scaffolding techniques which initially offers support then gradually reduces the support as students learn how to self-monitor
Analyzing and simplifying problems	Teacher uses explicit instruction to teach students how to analyze and simplify problems
Developing higher-order questions	Teachers train students to ask higher-order questions rather than those that have only one answer
Developing working memory	Teachers assist students in the automation of lower-level functions

is essential in relation to their content knowledge, teaching behaviors, and teaching effects.

The broader landscape of metacognitive research in the university promises rich soils, but its territory in criminal justice is currently lacking as little prior research of the subject has been done. In a field such as criminal justice, metacognitive thinking is a particularly useful and valuable tool. Graduates from criminal justice programs move from academia and enter a profession that involves a large amount of discretion and self-directed work. Developing metacognitive thinking during their undergraduate careers allows criminal justice graduates to improve critical thinking, better process new and different information and scenarios, and prepares them to perceive the world more openly.

In this research, we examined the effectiveness (objective and subjective) of metacognitive learning techniques in core criminal justice courses (juvenile delinquency/justice, and criminological theory). Specifically, this research tested whether or not the use of metacognitive Think-Assess-Learn (or TAL) assignments improved overall course performance and whether or not students themselves noted any change as a result of the TAL assignments in how they learned the course material.

Current Study

This study utilizes a metacognitive exercise developed by first author during a Metacognition and Writing Improvement workshop that took place at university located in the southeast United States. The TAL exercise was designed to help students develop two key elements of metacognition, metamemory, and meta-comprehension, with both in-class and out-of-class writing activities to provide increased active participation with the course material by the students.

While implementing this exercise, each lecture period began with the students taking five minutes of class to complete the *Think* section of the TAL. This section of the activity is designed to test a student's metamemory. The questions are related to course readings that were to be completed prior to that day's lecture and were designed to prepare students for participation in lecture discussions. This section was the only section that was designed for students to complete while in the classroom; the other sections were designed to be out-of-class activities. While similar to a quiz, this section is not assessed for correctness. It is assessed for completion with the goal of allowing students to feel free to take risks in their answers and engage in evaluating their knowledge of readings.

Following each lecture, students move on to the *Assess* section, which was designed to prompt metacomprehension. These questions ask the student to assess their own knowledge and evaluate the answers that they provided in the Think section. While questions in the Think section varied depending on content, the Assess section contains the same three questions in each exercise: "How accurate was your answer compared to the text and lecture? (Where does your answer align/misalign with the readings and lecture?)" "Describe

your preparation for today's class? (What did you do in advance of the lecture?)" and "To better prepare for class, what strategies should you implement?" The questions in the Assess section were designed for several purposes: to make students aware of gaps in their knowledge, to encourage them to think about their preparation, and to allow them to brainstorm ideas for more effective preparation strategies.

Finally, students complete the *Learn* section. The Learn section serves dual purposes in helping to improve both metamemory and metacomprehension. The questions contained in the Learn section were designed to help students process and digest some of the more complicated or in-depth concepts presented in lecture. Questions in this section ranged from explaining key tenets of theories and key cases to comparing and contrasting the tenets of competing theories and applying them to practical situations. For example, the following questions were used in the Learn section: "Explain why police data is the most relied upon source of official data" "What are the neutralization techniques developed by Sykes and Matza and what are some examples?" "How have due process cases related to the juvenile justice system shaped the juvenile court's structure and functioning?" Students are able to consult their notes from lecture, the text, and any other source of knowledge related to the particular questions of the day.

Methodology

Data and Sample

The data used in this pilot study were obtained from anonymous evaluations of metacognition exercises, open-coding of student responses to end of semester reflections, and overall class performance assessment averages. With IRB approval from the authors' institution, data were collected from students enrolled in the first author's two summer courses (Class 1 which covered the topic of criminological theory and Class 2 which covered the topic of juvenile justice and delinquency), which included a total enrollment of 66 students. The overall enrolled sample was 51.5% male and 48.5% female, and 57.5% white and 42.5% non-white. These demographics are comparable to the university's demographics of 59% female and 41% male, and 68% white and 32% non-white. These comparable demographics demonstrate that students enrolled in these courses were not markedly different in their demographics from the general university population, which would allow our results to be more generalizable. All students were given the option to provide consent for the use of any identifiable information and to participate in a longitudinal, follow-up study. Consent was gathered by the second author while the instructor remained outside of the classroom so as not to bias students in their decision to consent to the research study. Regardless of consent, all students received the same materials, instruction, evaluations, and opportunity to submit end of semester reflections.

Midterm Evaluations and Reflections

Anonymous student evaluations of the TAL exercises were completed at the beginning of class period at the midpoint of the semester via paper and pencil surveys. In total, 64 of the 66 enrolled students completed the midterm evaluations. The use of paper and pencil surveys was chosen to improve response rate. In the survey students were asked to respond to eight seven-point Likert scale items and three open-ended questions.

The first section contained a group of three items: overall quality of the TALs, overall relevance of the TALs to course, and overall usefulness of TALs. Students were asked to rate each of the three items with a range of 1—7, one being poor and seven being excellent. The next section included a group of five statements: I take time to complete my TALs fully, the TALs help me to better understand, I put little thought into the TALs, I notice patterns in my TALs, and I dislike completing the TALs. Students rated each statement with a range of 1—7, one being completely disagree and 7 being completely agree. Following the Likert scale items, students responded to three open-ended questions asking them what they liked most about the TALs, what they liked least about the TALs, and how they would improve the TALs.

End of Term Evaluations and Reflections

The end of semester reflections on the TAL exercises were given to the students three days prior to the last lecture and were due on the day of the last lecture. In these reflections, students were asked to respond to a series of open-ended questions:

> Looking back at your reported preparation for each TAL, what patterns or correlation do you see between what you did to prepare for lecture and whether or not your answers to the THINK section aligned or misaligned? How was your reported preparation impacted by what you thought you should be doing to prepare for class? Did you take your own recommendations for preparation? Why or why not?

> The LEARN section was designed to test your comprehension of text and lecture topics that can be difficult to understand or take practice to grasp. What patterns do you see when you look back on your completion of the LEARN section questions?

> The ASSESS section was designed to demonstrate the connections between your preparation and your understanding of course material. Looking back on your responses, what does this section tell you about yourself as a learner? What strategies of preparation were most helpful to your academic development?

While these reflections were optional to complete, student participation was incentivized by offering a small amount of extra credit toward the student's overall class participation grade.[1] In total, 36 out of the 66 enrolled students completed the end of semester reflections. Finally, we collected data on the average exam scores for Class 2 using the TAL exercises and compared these average exam scores to average exam scores from the first author's previous summer semester section of Class 2 that were delivered in identical ways (i.e. same lectures, assignments, and tests) aside from the use of TAL exercises.

Analysis Plan

Our analysis plan involved the use of mixed methodology. To determine whether or not the TAL exercises made an objective impact on student learning and understanding of the material we used t-tests to compare average test scores for the Class 2 sections (one which used the TAL exercises and one which did not). From the anonymous evaluations of the TAL exercises, we calculated the perceived value of the exercises based upon student responses to a variety of Likert scale items.

   In addition to our quantitative assessment, we utilized a qualitative content analysis approach to analyze both the anonymous evaluations and the end of semester reflections to determine common themes and elements present in student responses. To build concepts from textual data sources, a text needs to be opened up to reveal its underlying themes. Open coding analysis of texts is one method for doing so, as it refers to a technique for exposing the meaning, ideas, and thoughts contained in a text without any other restrictions (Creswell, 2009). This method involves a process of reducing textual data to a small set of themes that appear to describe the phenomenon that is under investigation. During open coding, collected textual data are divided into segments and scrutinized for commonalities that could reflect categories or themes. To develop these segments, we relied upon the use of Microsoft Excel's search function to identify the most common words and categories of thoughts used by the students. Once the data have been categorized, they are then examined for properties that characterize each category. Such examination involves asking questions, making comparisons, and looking for similarities and difference in each data-set. Both the first author (who was also the instructor) and the second author (who had no contact with the students outside of the informed consent process) worked independently to categorize student thoughts, we then compared our categorizations to increase the reliability of our open coding. From this open coding we calculated frequencies of occurrences.

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1. While students were incentivized to complete the end of term evaluation, they were also provided with other options to earn extra credit that did not involve completing the end of term evaluation. Therefore students were not coerced into participating in this aspect of the study.

Findings

Objective Impact of TAL Exercises

Using class averages for exam scores in the two sections of Class 2 (juvenile justice and delinquency), Section 1 using TALs and Section 2 not using TALs, we conducted t-tests to see if the use of the TALs in Section 1 corresponded to significantly different (preferably higher) exam scores than the exam scores observed in Section 2. In Table 2 we present the average exam scores for each section and the results of the t-test analysis.

The results of the t-tests show that while section 1 scored significantly higher on exam 1, Section 1's average exam scores on exams 2 and 3 were not significantly different from the average exam scores of Section 2. These results provide some support for the objective impact of the TAL exercises, especially in the beginning of the course. The fading differences in the section exam averages may suggest that the TALs are most useful at the beginning of a course to help orient students to an instructor's particular teaching practices and style.

Student Perception of TAL Impact

Using anonymous mid-semester evaluations of the TAL exercises in both Class 1 and Class 2, we found consistent patterns across both courses. In Table 3, we present the average ratings for quality, relevance, and usefulness.

Table 2 T-test comparisons of average exam scores for Class 2

	Exam 1	Exam 2	Exam 3
Section 1[1]	78.14	75.34	76.07
Section 2[2]	75.04	73.79	77.68
T-value	3.10	1.55	−1.61

[1]N = 30; [2]N = 34.

Table 3 Student perceptions of TAL quality, relevance, and usefulness

	Class 1[1]	Class 2[2]
Overall quality	5.17	5.31
Overall relevance	5.54	5.96
Overall usefulness	4.89	4.73

Note. Response options ranged from 1 (poor) to 7 (excellent).
[1]N = 36, Response rate equaled 100%; [2]N = 30, Response rate equaled 93.10%.

The results from the mid-semester evaluation of the TALs show that on average students observed the TALs to be very relevant, somewhat useful, and of overall good quality.

Written reflections also offer evidence of the emergence of self-regulated learning for some students. In Student A's evaluation the usefulness and relevance of the metacognitive activity were related while also relating it to the three characteristics of self-regulation by remarking on how the TAL can support different aspects of metacognitive thinking and scaffolding students' self-regulation. The reflection began with a discussion of the student's preparation for the course, saying, "I always had a consistent answer for what I should do to better prepare …" For this student, the Assess section offers specific self-regulated learning strategies and a starting place for review and preparation. Their reflection goes on to include a statement of metacomprehension by commenting, "I learned that I was more engaged and aware of lecture topics when I chose to properly prepare by reading before class." This quote shows the good quality of the tools while also offering evidence of self-regulation's interdependent motivational processes that include responsiveness to a student's self-oriented feedback on the effectiveness of their learning and awareness of what appears to be emerging self knowledge of themselves as a learner (Zimmerman, 1989).

Student F's reflection offers a well-rounded example of the components of metacognition in the benefits of the Assess section. The learner starts with an expression of awareness of their metacomprehension in saying, "The Assess section showed me that in order to understand the material," which leads to mindfulness of a self-regulatory behavior to encourage success in the classroom by saying, "I would need to read over sections of the book to fully retain the reading." The learner includes another option for self-regulatory behavior to support their metamemory with statements like, "Skimming back over the chapter before class helped make the subject fresh on my mind before class which helped me better understand the material during class," and, "The most useful strategy to me was printing the Prezi transcripts because I have a difficult time taking notes."

Student C relates the overall good quality of the TAL to their self-regulation while discussing the TAL. The student begins by discussing awareness of the relationship between regulatory processes and academic achievement while explaining,

> In the past I have tended to brush off doing the required reading for certain classes because the content was not necessarily covered within the class or the teacher did not assess our knowledge of it until test time came.

They go on to discuss how this metacognitive tool facilitated their use of this knowledge by stating, "The TAL proved to be extremely helpful in holding me accountable of my own preparation for each and every class period." According to this student's reflection, the TAL promoted personally directed forms of

learning, allowing the student to see learning as a systematic and controllable process. While these students and others may be aware of how well they remember content, how well they understand content, and how they could improve memory and understanding, this does not mean they will act on this knowledge.

Following the collection of data on quality, relevance, and usefulness, we also collected student perceptions of how they felt about the TALs along with whether or not they perceived the TALs to be helping their learning. We present the average results in Table 4.

These results indicate that students tended to notice patterns in their responses and took time to complete them. They slightly agreed that the TALs helped them to better understand the course material, and they neither agreed nor disagreed that they put little thought into the completion of the TALs and that they disliked the TALs. While the examples from the previous section provide evidence of student awareness of the possible benefits of this metacognitive task, the results of student perceptions indicate some resistance to the proactive processes involved in self-regulated learning.

Many student reflections on the Think section showed evidence of awareness of metacognitive skills with statements like, "If I read the assignment, I did well on this section." Several also responded to question 2 about how they prepared for class and the recommendations they gave themselves on preparing for classes by saying they "wrote the same thing every time," but not all of them took their own advice. These observations of self-knowledge demonstrate a lack of self-regulation, resistance to deviation, or response inhibition (Zimmerman, 1990). For example, Student D shared their reflections on this phenomenon by saying, "It was like I knew what I should have been doing but I wanted to do things my own way …" In this instance, the learner claims to have both the metacognitive knowledge and skills for academic success but still fails to amend their actions. This may be evidence of a conscious or unconscious resistance to change that is not uncommon for classroom learners (Jing, 2006; Veenman, Van Hout-Wolter, & Afflerbach, 2006). The student reflections discussed below may hold some possible reasons why this transition may not occur.

Table 4   Student feelings and perception of TALs

	Class 1[1]	Class 2[2]
I notice patterns in my responses	5.86	5.20
They help me to better understand	4.63	4.62
I put little thought into completion	3.09	3.58
I dislike completing	3.80	4.46
I take time to complete	5.51	5.08

Note. Response options ranged from 1 (completely disagree) to 7 (completely agree).
[1]*N* = 36, Response rate equaled 100%; [2]*N* = 30, Response rate equaled 93.10%.

Results from Open-coding

To better quantify the relative impact of the TALs, we engaged in open-coding of open-ended responses in both the anonymous mid-semester evaluations and end-of-semester reflections, which allowed us to observe several key themes. Like the student evaluations of the TAL discussed above, the results of this open-coded analysis provide evidence of the complexity and interconnectedness of metamemory, metacomprehension, and self-regulation, the three components of metacognition. Additionally, these writings reflect that students can recognize and articulate metacognitive knowledge and skills, but this does not always result in self-regulation of learning.

In the mid-semester evaluation, the aspects students reported liking most about the TALs mirror some of the benefits that are discussed above: The TALs were perceived as helpful (26.23% of responses), helped them to review and refresh (22.95% of responses), encouraged them to read over the text and notes from lecture (26.23% of responses), and impacted their learning of the material (18.03% of responses). What students liked least about the TALs reveal some of the possible reasons for student resistance and why they may be able to discuss knowledge and strategies but fail to put them into action. The following were the most often observed: the repetitiveness of the answering the Assess section (37.70% of responses) especially the questions about preparation (14.75% of responses), the use of TALs everyday (11.48% of responses), and the perception that the TALs were busy work (8.20% of responses). Finally, when asked how the TALs could be improved, students responded most often with the following: remove assess questions (19.67% of responses), nothing could be improved (18.03% of responses), reduce frequency of TALs (16.39% of responses), and modification of assess questions (11.48% of responses).

Themes from the end of semester reflections provide further evidence of metacognition along with other possible reasons for a lack of self-regulation. A majority (52.78%) of students noted positive, self-regulatory actions they took in response to their TAL performance, and a smaller percentage of students noted that the TALs were useful (25%) and aided in their metamemory and metacomprehension while preparing for exams (19.44%). Student A's reflection provided an example of metacognition leading to self-regulation in their response to question 2 of the end of semester reflections:

> Honestly it took me a couple of days into lecture to realize I was going to have to start some sort preparation system for these TALs … Once I started to develop good habits I was able to give knowledgeable answers which lead me to continue to take my own advice and do what was necessary to stay engaged in the material.

As was the case for other students in the course, the TAL made student A aware of their individualized learning and study habits that would be effective

for this course, providing a kind of formative assessment, or feedback loop, for the student to then reassess and revise as needed (Zimmerman, 1989). While some students (33.33%) reported self-regulation by intentionally changing their class preparation strategies in response to the TALs, several students (27.78%) reported that the demands of their schedule made it difficult to prepare for class and self-regulate the way they think that they should have prepared.

Student responses also reflected a use of resources like the text and course lectures to engage their memory and evaluate comprehension when completing the TALs (72.22% for lecture notes and 61.11% for the text). In these cases, students used the TAL as a metamemory and metacomprehension strategy, comparing their own knowledge and understanding to those expressed by disciplinary experts and providing a trigger for memory. This could also be a method of individualized formative assessment on which they could base efforts for self-regulation. For example, student H's comment on the Think section reflected a strong association between the text, lecture, and the TAL when they said:

> This section was usually the section I completed with a lot of detail and accuracy because of what I learned in the lecture and the information I could go back and look at using the book …

In this context, student H's attention to detail written out serves as a visual representation of their level of metacomprehension while their return to the text to compare to allows the learner to check their metamemory, identifying any instances where their memory or understanding does not align with that of the experts on the topic(s) (i.e. the textbook and the teacher). Additionally, the effort and physical activity of writing by hand strengthens the learning process overall (Mueller & Oppenheimer, 2014).

Student C's response to question 1 of the end of semester reflections highlighted a similar situation in which failure to properly prepare for the course was reflected in their inability to respond this section of the TAL:

> There was one instance where I had not done the required reading for the upcoming lecture the night prior and my response within the THINK section of the TAL was not correct in any way.

This student's response to the Think section served as evidence of their lack of preparation and a reminder of the skills needed be a more effective student and succeed in the course.

Discussion

The results of the study suggest that TAL assignments have the greatest objective value at the beginning of a course with diminishing returns as the course

progresses (although never to the point of negatively impacting grades). While the results of the objective analyses were nuanced, the results of the subjective analyses painted a much clearer picture. Overwhelmingly, students perceived the TALs as useful, helpful for their course preparation, and relevant to the course material covered during each corresponding lecture. Many students also highlighted how the TALs made them aware of learning and study habits that were most effective for them as individuals. Overall, the results of this study suggest that metacognitive learning techniques can and do have a meaningful impact on criminal justice students.

Because of the situated nature and complexities of teaching and learning, research on the effectiveness of strategies like metacognition and self-regulated learning continues to be a challenge. Metacognition and its intellectual fruits do not always present themselves in the current learning context, not "clicking" until later. Also, complex factors like students' beliefs about intelligence and learning can influence metacognition itself (Ambrose et al., 2010). Self-regulated learners engage in higher-order thinking on multiple levels (Nelson, 1996). They do not just transfer knowledge gained and apply it in a new context exactly as it was. Rather, this knowledge is transformed by the learner and the learner is transformed by the knowledge (Smart & Brown, 2002). Evidence of such thinking can also be difficult identify as such. As Wardle (2009) explains when discussing the reuse of higher-level knowledge and strategies, we should not look for apples when they have already been made into apple pie. Because higher-level knowledge and strategies are transformed depending on student prior knowledge and new contexts, it is difficult to know when it may appear and what it may look like. Rather than just directly probing students for explicit instances of meaningful metacognition and transformative self-regulative learning, it can be more productive to use research methods such as observation and interviews (Brent, 2011; Zimmerman, 2008).

While this research project's results suggest an overall positive effect of metacognitive learning techniques, there are limitations to our study that we must acknowledge and hope spur further academic research and discourse within criminal justice education research. First, testing the TAL assignments during summer sessions lead to many students feeling overwhelmed by the repetition of the ASSESS questions and likely led students to spend less time completing and working through the TAL assignments completely. We used the summer session due to the existence of a nearly identical (demographically and course delivery) control group who completed the course without the aid of the TAL assignments one year before. Future research should look to examine the impact of metacognitive learning techniques for courses during traditional semesters, but given the positive results observed during condensed summer courses we expect to find the same or even more positive results. Second, this study was only able to examine retention of information while the course was in session. If metacognitive learning techniques are to be useful, they must be able to influence retention of information past the end of any particular course. Future research should look toward the long-term effectiveness of metacognitive learning techniques in

demonstrating retention of important course concepts and objectives. Finally our results were limited by the size of the sample and the background information on the sample available to us during the study. Summer courses have capped enrollments and generally lower levels of enrollments than spring or fall semester courses, leaving us with only a population of 66 students from which to draw our sample. Our sample size may have directly contributed to the non-significant results we observed in our objective analyses and further research with a larger sample of students may yield different results. While the size of the sample was not ideal, we were able to draw upon a quasi-experimental research design to provide a fairly rigorous test of the effectiveness of a change in pedagogy by utilizing a comparison group who experienced the same course and received the same materials (aside from the TALs). Even with our limited sample size, the results provide a foundation for continued research into the use of metacognitive learning techniques in criminal justice education. In addition to our limited sample size, we were also limited in our ability to gather a greater amount of background information on the students who participated in this study. To comply with the institution's IRB, we were unable to access protected student information regarding their academic history at the institution (including GPA). Because we were able to only examine demographic characteristics, there exists the possibility that our results may be biased by differences in GPA of the students for which we were unable to account. While the potential for this bias certainly exists, we contend that given the comparable demographics and course schedule (both courses delivered at the same time of day during summer semesters), that there is little reason to suspect that our samples would be markedly different from one another in terms of academic ability (as measured by GPA). Nonetheless, future research should also look to examine whether the effect of the TAL exercises varies based upon student academic ability level.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on Contributors

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