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Guiding students to success: A systematic review of research on guided notes as an instructional strategy from 2009-2019

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Abstract

Guided notes were introduced decades ago, but there is still debate over their efficacy in improving student outcomes. The purpose of this study is to examine peer-reviewed research on guided notes for adult learners in general populations since 2009, understanding the effects of guided notes on student learning, the knowledge and content areas supported by guided notes, and the impact of modality. Results of the 22 included studies indicate that students perceive guided notes in a positive light, and guided notes improve results in certain knowledge domains especially with complex content. However, modality does not influence the efficacy of guided notes. Implications for practice in teaching and learning and recommendations for research were provided.

Keywords

Guided notes, note taking, efficacy, self-regulated learning, systematic review

Introduction

A ubiquitous form of content delivery in higher education is the classroom lecture, whereby a professor talks, sometimes with visual aids such as PowerPoint presentations, and the students take notes. Students taking notes in classroom lectures is strongly correlated to student success (Williams & Eggert 2002; Titsworth & Kiewra 2004). Unfortunately, note taking is a high-cognitive load task, requiring students to move content from their sensory memory to their working memory, and ultimately to their long-term memory. At the same time students are asked to think critically about the content. This demand of mental resources further complicates the ability for students to encode meaningful and sufficient notes while processing the information (Piolat, Olive, & Kellogg 2004). Additionally, attention spans have dwindled, as students have many competing interests (e.g. social media, games) and need further prompting to remain focused (Blom 2017). As a result, the quality of student notes is often not sufficient for the later storage and studying of those notes (Nakayama, Mutsuura, & Yamamoto 2014). Studies have found that students' notes may include as little as 11 percent of the crucial information in a classroom lecture (Kiewra 1985; Raver & Maydosz 2010). These problems are further exacerbated in online environments, where there is no direct accountability from the physical presence of an instructor.

The consequence of the above information is that students need help, prompting, and/or guidance to take notes. One solution is to provide scaffolding for students' notes, known as guided notes. Guided notes have many forms including fill-in-the-blank outlines, printed PowerPoint slides, partially-completed outlines, partially-completed PowerPoint slides, and notes with metacognitive guidance. For the purposes of the present study, guided notes are defined as, teacher-prepared materials that guide a student through a lecture with standard cues and prepared space, which was broadened and adapted from Heward's (1994) definition to include advances in technology and methodology.

Since the 1970s, researchers have experimented with various methods of note-taking facilitation handouts. Carter and Van Marte (1975) discovered that students perform better when actively engaged in note taking than when they are given notes. One study articulated that students with *skeletal notes* performed better than students who took notes unassisted (Klemm 1976). Peper and Meyer (1978) later investigated note-taking as a generative activity. Early and more recent evidence demonstrates students with guided notes outperformed students with full lecture notes and students who were given no notes (Katayama 1997; Katayama & Robinson 2000; Kiewra 1985; Kiewra, et al. 1988). Along with higher performance, students with guided notes participated more in class (Austin et al. 2002). Vandehey, Marsh and Diekhoff (2005) provided evidence that contradicted previous studies. Subsequent studies concluded that guided notes supported student achievement (Cornelius & Owen-DeSchryver 2008; Grabe, Christopherson, & Douglas 2005; Neef, McCord, & Ferreri 2006).

There is an ongoing theoretical debate as to whether the main purpose of note-taking is encoding or storage and how to facilitate that whichever main purpose better (Kauffman, Zhao & Yang 2011; Worthington & Levasseur 2015). To help determine whether or not and in what ways to use them, more research is needed on how guided notes impact the many levels of a classroom (i.e. student perceptions, student outcomes, participation) and help educational practitioners discern between the previously-mentioned studies that may deliver mixed messages. Furthermore, more research is needed to help apply current research to the nuances of the online environment.

Theoretical Underpinning

Rooted in cognitive psychology as an instructional technique, note-taking is essentially a task of self-regulation and metacognition. Self-regulated learning is the process by which one monitors one's own thinking and learning, which is what students do when they are listening to the new material and determining whether or not to write it down and it is a vital aspect to learning (Reid & Morrison 2014). Features of self-regulated learning in note-taking include "layers of context, what individuals bring, mediating variables, task interpretation, personal objectives, self-regulated learning processes, cognitive strategies, and performance criteria" (Lawanto & Santoso 2013, p. 90). Another way to view note-taking as self-regulated learning is to view note-taking as actively monitoring, reflecting (during and after), and revising processes for future applications (Kauffman et al. 2011). Guided notes help to guide the learners with a common, instructor-created handout so they can improve metacognitive processes and use the guided notes as to advise self-regulation.

Note-taking can be understood from an information processing perspective. Students are transferring information from their sensory memory when they hear the lecturer and/or view the PowerPoint slides to their working memory as they write down the notes. Working memory during note-taking is strained through the many cognitive demands such as writing and listening comprehension (Kauffman et al. 2011; Katayama & Robinson 2010; Makany, Kemp & Dror 2008), and therefore guided notes can be used to help alleviate cognitive load to allow for increased cognitive capacity for higher-level cognition. Narjaikaew, Emarat and Cowie (2009) argue that information processing theory is at the center of the guided notes conceptual framework because it is the foundation of how instructors create the notes so as to meet the students at their capabilities to make the learning meaningful and interesting. They also argue it is not sufficient to have the students take notes, but that the notes are meaningful and that the information is comprehended.

Additionally, note-taking is often considered a generative learning strategy (Peper & Mayer 1986; Lee, Lim, & Grabowski 2008). The brain does not simply take in knowledge, rather it thoughtfully constructs knowledge (Reid & Morrison 2014). By listening to a lecture and taking notes, the students are assimilating the new knowledge into their preexisting knowledge. Guided notes, as a scaffolding strategy, promote generative learning by enabling students to focus more of their cognitive energy on higher-order thinking and learning activities (e.g. summarizing, highlighting, and metacognition) (Lee, Lim, & Grabowski 2010). Scaffolded notes give students another resource to help facilitate the assimilation of new knowledge with preexisting knowledge as scaffolding is an interactive, instructional support provided by the instructor to facilitate learning and self-regulation (Delen, Liew, & Wilson 2014). Lee et al. (2010) specifically noted the benefits of guided notes as scaffolding that addressed issues seen in students' note taking behaviors.

Purpose of the Study

In addition to Kiewra's (1987) seminal review articulating solutions that may help address issues in ineffective note-taking, there have been two recent systematic literature reviews on guided notes. Konrad, Joseph and Eveleigh (2009) found that guided notes were an effective method of improving student learning outcomes. Larwin and Larwin (2013) also found that guided notes create a moderate improvement on student performance. Currently, gaps exist beyond these two reviews in that neither study address articles written since 2009. Additionally, neither study addresses the universality of guided notes (e.g. teaching modality, types of knowledge, content areas). Neither study investigated student perceptions of guided notes or the effects of guided notes on other areas (e.g. participation and attendance). The Larwin and Larwin (2009) study is different from the present study because it focuses on children and included children and included students with learning disabilities.

The purpose of the current study is to investigate the impact of guided notes from literature within the past ten years and to identify areas for future research. The following are the research questions addressed in the systematic review:

1. What effects do guided notes have on student learning in lieu of no provided guidance, full instructor notes, or other guidance?
2. What types of knowledge and content areas are supported by guided notes?
3. What impact, if any, does delivery modality have on the efficacy of guided notes?

Methods

To ensure a wide variety of resources were researched, electronic searches were conducted through two university library systems and through Google Scholar. Other research articles were mined for related articles. The search term that was used was "'scaffold* note*' OR 'instructor-provided slide*' OR 'instructor-provided note*' OR 'guided note*' OR 'cloze note*'. These searches yielded 112 articles after duplicates were removed. Forty-seven results were acquired from Google Scholar. Eight results were acquired from one university's database, which searched APA PscycNET, Education Source, and The American Educational Research Association databases. Twelve results were acquired from another university's database, which searched Education Database, ERIC (ProQuest), PsycARTICLES, PsycINFO, Psychology Database, and Teacher Reference Center databases. Forty-three results were acquired from *snowball sampling* or reviewing other authors' citations. Figure 1 shows the article selection process.

A set of selection criteria were then applied to the 111 articles to bring the total down to 22 articles. These criteria include:

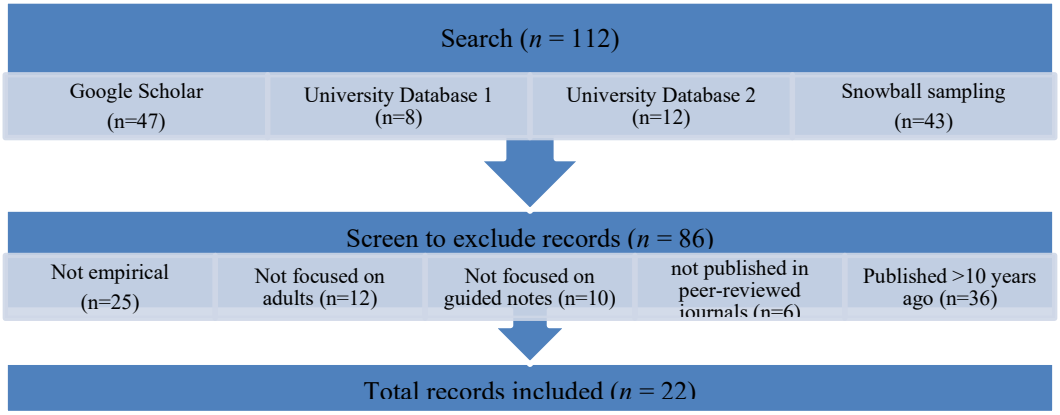
1. Research should primarily focus on addressing issues around efficacy of guided notes in higher education settings. Studies that do not address efficacy related issues, or were situated in other settings, such as K-12, or professional development, were therefore excluded;

2. Research should be empirical studies reporting empirical data drawn from actual observations or experimentations. Studies such as conceptual articles, reviews, thesis and dissertations, as well as unpublished works were not included in the analysis.

3. Research must be published in peer-reviewed, English-language, academic journals within the selected 10-year time frame (2009–2019). Papers that were published in non-peer-reviewed, non-English-language journals, conference proceedings, or outside this time frame were excluded.

The studies sampled areas from various countries in various regions around the world. There were three studies from Thailand (Narjaikaew et al. 2009; Sari, Jasmidi, & Sudrajat 2016; Sujarittham et al. 2016). There was one study from Taiwan (Chen, Teo, & Zhou 2017). There was one study from Iran (Avval, Jarahi, Ghazvini, & Youssefi 2013). The remaining 17 studies were from the United States of America, where only the Worthington and Levasseur (2015) study did not have any positive results.

Figure. 1 Flowchart for article selection process



Results

Table 1 on the following page summarizes the research on the guided notes with the 22 articles who met the selection criteria.

RQ1. What effects does guided notes have on student learning?

Of the 17 articles that measured guided notes to full notes or no notes, 15 articles found that they improved student learning gains (see Table 1). For example, Glodowski and Thompson (2018) note the group with guided notes averaged 10 percent higher quiz scores and took 36 percent more accurate notes in an introductory psychology course than the group without guided notes. In the study from Gharravi (2018), Chi-squared tests were performed to measure the differences in exam score between classes with and without guided note-taking approach. The results showed significant positive effects of the guided notes ($\chi^2 = 10.54$, $p = 0.023$). Narjaikaew et al. (2009) noted that the effect size as measured by Cohen's d equaled 0.46 (medium) in their study for the more refined version of guided notes that incorporated diagrams, pictures, blank spaces, and tables, whereas for the conventional teaching approach without guided notes was only 0.07 (small). Only one study, Worthington and Levasseur (2015), found that guided notes lowered student outcomes, indicating the students performed better with no PowerPoint slides provided during the notetaking process. This study examined the relationship between access and use of discrete types of instructor-provided slides versus no slides on exam performance. In the no slide condition, students were not allowed to access any PowerPoint slides during course lecture. In the partial slide condition, students were provided with key words and phrases on the left side of the page and note-taking space on the right as what one will print from a PowerPoint handout format. In the full slide condition, students can access and use a full handout containing a list of bulleted points including complete definition and explanation on the right and note-taking space on the right. Additionally, only one study, Babb and Ross (2010), who compared full instructor-provided PowerPoint slides given before class to full instructor-provided slides given after class found that they did not have an effect on learning outcomes.

There is some debate over whether guided notes have more impact with delayed assessments. Some authors found that the students had no effect on immediate tests, but that the notes helped the students with tests that were delayed (Chen et al. 2017; Cardetti et al. 2010). Another author found that the guided notes had positive effects on the immediate tests as well as with the delayed tests (Williams et al. 2012).

Table 1. A summary of empirical research on guided notes with general population adult learners from 2009-2019

Authors	Results
Avval et al. (2013)	The students liked having guided notes, felt it helped them succeed, and felt it increased their focus
Blom (2017)	Students with guided notes achieved higher test scores
Babb & Ross (2009)	Mean attendance was higher with guided notes provided it was not factored into the grades; participation was higher if guided notes were given; no significant difference in exam performance results
Bui & McDaniel (2015)	Guided notes had a positive effect on student test scores across a variety of types
Cardetti, Khamsemanan, & Orgnero (2010)	Guided notes helped students achieve better results on delayed tests, but no improvement on immediate tests
Chen et al. (2017)	Students with guided notes took better notes; students with guided notes did not score better on the immediate posttest, but did better on the delayed posttest; students with guided notes thought it had a positive effect on their note-taking
Delen et al. (2014)	Students take better notes when they can interactively take guided notes
Gharravi (2018)	Guided notes led to more students taking notes; students with guided notes scored better on the exam; students with guided notes took better notes
Glodowski &Thompson (2018)	Guided notes produced statistically significant improvements in quiz scores and note accuracy
Iannone & Miller (2019)	The students interviewed generally preferred to attend lectures supported by guided notes; there was a great variety of note-taking behavior
Kauffman et al. (2011)	Students with matrix notes outperformed conventional or outline notes; self-monitoring prompts were helpful for the students
Lawanto & Santoso (2013)	Guided notes improved self-regulation in learning
Lee et al. (2010)	Generative learning and metacognitive feedback improve learning outcomes
Makany et al. (2008)	Non-linear note-taking methodologies were better than linear methodologies in quantity and quality of learning
Narjaikaew et al. (2009)	Students with guided notes had better outcomes than those without guided notes
Ponce & Mayer (2014)	Students with graphic organizers outperformed students with guided notes or no notes; students with guided notes outperformed students with no notes
Raver & Maydosz (2010)	Students with guided notes outperformed students without guided notes
Reid & Morrison (2014)	Guided notes helped students achieve better results on higher-order thinking questions, but not on lower-order thinking questions
Sari et al. (2018)	Students had a positive outlook on guided notes; guided notes provided a positive impact on student results
Sujarittham et al. (2016)	The students found the guided notes to be helpful; guided notes increased student comprehension
Williams, Porter, & James (2012)	Guided notes led to substantially higher scores
Worthington & Levasseur (2015)	No significant difference in guided notes score outcomes or note completion, regardless of student proficiency

The researchers unanimously determined that students appreciate guided notes. Iannone and Miller (2019) found that the students appreciated the guided notes for a variety of reasons, including that they felt like they would have a well-structured set of notes. Chen et al. (2017) found that 96.9 percent of the students thought the guided notes had a positive effect on their note-taking. The students appreciated the guided notes in two other studies, as well (Avval et al. 2013; Reid & Morrison 2014). Sari et al. (2018) found that 95 percent of students had a positive response to guided notes and 85 percent of students found the notes to be feasible.

Several of the articles studied other areas, either in addition to studying student learning gains or instead of studying student learning gains. Babb and Ross (2009) found that guided notes, full instructor-provided slides in their case, may have a positive effect on participation frequency. Guided notes, in the form of partially-complete instructor-provided PowerPoint slides, were also found to increase focus (Avval et al. 2013). It was also determined that if the notes can be built into

a video system, the students will take more notes (Delen et al. 2014). Babb and Ross (2009) found that guided notes improve attendance, but only if attendance is not required. On the other hand, Worthington and Levasseur (2015) found no impact on attendance, although it was not explicitly communicated whether or not the authors required attendance.

RQ2. What types of knowledge and content areas are supported by guided notes?

Guided notes support a wide variety of content areas and knowledge domains. There were positive effects of guided notes in social sciences such as psychology (Glodkowski & Thompson 2018; Chen et al. 2017; Williams et al. 2012), law (Blom 2017), special education (Raver & Meyer 2010), and general social science (Babb & Ross 2009). For example, Blom (2017) used guided notes to facilitate lectures in a communication law class, resulting in higher scores, more time to cover more content in lectures, and deeper dialogue with students on those subjects. In another study of alternating treatments in undergraduate psychology, students were found to achieve higher scores on immediate and delayed posttests (Williams et al. 2012). It was, however, in the social science (communication) that the one negative effect was found (Worthington & Levasseur 2015).

In the natural sciences, positive effects of guided notes were attributed in medicine (Gharravi 2018), physics (Narjaikaew et al. 2009; Sujarittham et al. 2016), engineering (Lawanato & Santoso 2013), biochemistry and microbiology (Avval et al. 2013), analytic chemistry (Sari et al. 2018), biology (Kauffman et al. 2011), and anatomy (Lee et al. 2010). Guided notes were also helpful in formal sciences such as math (Ianonne & Miller 2019; Cardetti et al. 2010) and information systems (Makany et al. 2008). Guided notes were even helpful in technical areas such as pumps and brakes (Bui & McDaniel 2015), renewable energy (Delen et al. 2014), steamboats (Ponce & Mayer 2014), and photography (Reid & Morrison 2014). A natural science example is when students with graphic organizers outperformed students with guided notes, who outperformed students with no notes in a lesson and subsequent test on steamboats (Ponce & Mayer 2014).

RQ3. What impact, if any, does delivery modality have on the efficacy of guided notes?

Our findings suggest that guided notes are effective regardless of delivery modality. The aggregation of the studies found consistency in delivery methods. The guided notes were effective in all of the computer-based studies (Bui & McDaniel 2015; Delen et al. 2014; Lee et al. 2010; Ponce & Meyer 2014; Raver & Maydosz 2010; Reid & Morrison 2014). The guided notes were effective in 12 of the 13 face-to-face studies (Babb & Ross 2009; Blom 2017; Cardetti et al. 2010; Chen et al. 2017; Gharravi 2018; Ianonne & Miller 2019; Lawanto & Santoso 2013; Narjaikaew et al. 2009Williams et al. 2012). The guided notes were effective in improving student outcomes in both reading studies (Glodkowski & Thompson 2018; Kauffman 2011). For example, in the face-to-face classroom, Chen et al. (2017) found that students with guided notes outperformed students without guided notes and found that those students with guided notes had positive perceptions of the guided notes. In a computer-based study, Delen et al. (2014) indicated that students with the ability to control the video (i.e. play, pause, fast forward), take notes, and participate in metacognitive questioning scored better than students who only had the ability to control the video (i.e. play, pause, fast forward). The Worthington and Levassauer (2015) study was the only face-to-face study where guided notes did not show any benefits. The results from Worthington and Levassauer (2015) demonstrated that guided notes had no impact on class attendance and adversely influenced students' exam performance in the course. There were no studies that addressed the online modality outside of the computer lab or the blended learning modality, a point that will be elaborated on later in the present paper.

Discussion

The results of this systematic review further validate hypotheses across several cognitive theories to varying degrees while suggesting multiple affordances of guided notes in enhancing student learning. Through the lenses of self-regulation and metacognition, generative learning, information processing theory, and scaffolding, the studies in our review provide ample evidence demonstrating why guided notes would provide benefits for the students. The findings in our review reveal that the scaffolding of guided notes provides the students with the structure of what they need to learn in the lecture, which facilitates self-regulated learning (Lawanto & Santoso 2013). This also ensures the students have another repetition of the content in the lecture in addition to the lecturer and the lecturer's visual aids, if present. It also prompts the students to write to fill out blanks in the guided notes, which can gamify their learning. The gamification and scaffolding leads to students focusing on the areas the professor wants them to focus on, which leads to better results (Narjaikaew et al. 2009).

Viewing the above research in terms of information processing theory, students know the general framework of the lecture and can devote less cognitive load to their note-taking. This frees up cognitive resources to readily participate in class, access higher-level thinking skills such as analyzing, and focus on the professor (Lawanto & Santoso 2013). Furthermore, the framework helps the students assimilate the new content with their preexisting schema, as theorized through the generative learning theory (Lee et al. 2010).

By viewing the guided notes through a framework of metacognition, it becomes apparent that any type of guided notes allows for students to compare their cognition with the guide on the paper, determining if they are tracking the lecture or not. Additionally, the building in metacognitive prompts, in the style of Reid and Morrison (2014) or Lawanto and Santoso (2013), can provide the students additional benefits of improved self-regulated learning during computer-based learning or classroom lecture, respectively.

Implications for practice

Our study suggests that visual guided notes may facilitate student success better than linear or PowerPoint slides. Kauffman et al. (2011) found that giving the students a matrix to fill in provided better results than if the students worked in a traditional, linear style. Ponce and Mayer (2014) found that a graphic organizer provided the students with better results than non-instructor-organized notes, which was better than not taking notes at all. Similar results were discovered by Makany et al. (2008), who found that non-linear styles of instructor-provided notes were more helpful than linear styles.

Another type of structure that facilitates better student results suggested by this study is to develop the notes with metacognitive questioning. Lawanto and Santoso (2013) found that prompting the students with metacognitive questioning led to better self-regulation and better results on quiz scores. The research of Reid and Morrison (2014) illustrated how metacognitive questioning in guided notes facilitated significant improvements in higher-level testing.

Currently, the nomenclature that describes the various forms of guided notes is inconsistent, as several somewhat interchangeable terms currently exist (e.g. guided notes, Cloze Notes, skeletal notes, partially-complete notes, instructor-provided notes). We suggest that practitioners would propose systematic taxonomies and classification systems that may address this inconsistent and confusing nomenclature. Determining consistent nomenclature would be beneficial to help

researchers and practitioners more quickly make accurate comparisons when reading the literature. It would also help provide a strong encouragement for instructors to not discard more-effective guided note strategies when they have already tried less-effective guided note strategies. Ranking the efficacy of the various methods would help educators choose how to structure their guided notes.

Recommendations for future research

Given that there are many different forms of guided notes (e.g. fill-in-the-blank outlines, printed PowerPoint slides, partially-completed outlines, partially-completed PowerPoint slides, and notes with metacognitive guidance), further research would be helpful to determine the extent to which the format of guided notes impacts student perceptions, results and other factors. As some guided notes may help students more than other ones (Kauffman et al. 2011; Makany et al. 2008; Ponce & Mayer 2014), future research should delve into determining which methods provide better results. Along those lines, it may be helpful to gather insight into the efficacy of guided notes across various media (e.g. tablet computers, computers, mobile phones, paper), a topic which has been studied before (Mueller & Oppenheimer, 2014), but not in relationship to the guided notes. In light of such pervasive differences in the forms of guided notes, we recommend that researchers understand the nuance and specificity in different types of guided notes when conducting experiments. We also recommend that future research provide detailed descriptions of the guided notes implementation so the results may be better understood, replicated, and expanded upon. For example, knowing what students are expected to do with these notes when they are provided to them would be essential to expound upon the studies in order to reach a conclusion of their effects in that the type of learning tasks and activity involved may affect students' engagement level as well as their ability to reach intended learning outcomes.

We suggest that future researchers should further examine critical outcome variables such as participation and attendance and potential mediators such as time to deliver notes, and number of notes to deliver. Of the 22 research articles in the present study only one addressed the effects of guided notes on participation, and the authors found there to be a positive effect on participation (Babb & Ross 2009). A goal of some educators teaching face-to-face is to improve student participation and interaction. Educators considering guided notes would likely want to know its effects on participation. It could be hypothesized that students would participate more if they had to write less to take notes, based on the students' improved metacognition and ability to assimilate new material more easily through the scaffolded guided notes. As previously mentioned, no definitive results have surfaced from the two studies that attempted to gauge the effects of guided notes on student attendance (Babb & Ross 2009; Worthington & Levasseur 2015). Stacy and Cain (2015) pose that guided notes could cause adverse effects on student attendance. Further research determining the effects of guided notes on student attendance, specifically when attendance is and is not required and in lecture size, would give credit to or alleviate these concerns. Another area of research has been minimally addressed by the current literature is to determine the best time to deliver the guided notes (e.g. start of semester, session prior to meeting, day of class) and how many notes to deliver (e.g. the entire semester, a module, or just one day). Research could also be conducted to determine how guided notes impact various levels of learning (i.e. how guided notes impact learning on each level of Bloom's taxonomy). Along those same lines, it would be interesting to see the impact of guided notes on creativity, critical thinking, metacognition, and originality.

The online modality has only been studied a few times (Delen et al. 2014; Grabe et al. 2005), in spite of the fact that student enrollment has increased steadily for well over a decade (Seaman, Allen, & Seaman 2018). This online modality is especially relevant, given the rapid modality changes and uptick in remote teaching. Furthermore, there have not yet been any published studies on how guided

notes impact student achievement and student course perceptions in online, asynchronous environments, an eLearning strategy that many universities use. As mentioned previously, students are faced with more distractions than ever (Blom 2017). These distractions may be even greater when the source of learning (i.e. the students' computers) is also the source of the distractions. It would be interesting to research if the guided notes minimize these distractions.

Methodologically speaking, there have not been any longitudinal studies that seek to understand the long-term effects of guided notes on students' abilities to generate their own notes after that class. It is possible to teach how to take notes (Taylor 1982; Robinson et al. 2006), but it would be helpful to determine if guided notes facilitate improved practices or if they become a crutch for students to lose their abilities to take notes. Brazeau (2006) argued that providing students with guided notes will create an overreliance on those guided notes and that students will lose the ability to take notes themselves, but that argument has not been substantiated or disproven with research. If an overreliance on guided notes is substantiated, further research could also identify methodology to shepherd students toward utmost independence, note-taking ability, and content comprehension.

Furthermore, methodologically, many of the studies utilize quasi-experimental research designs, suggesting a need to transition toward a need for a large, true experimental study. For example, Glodowski and Thompson (2018) point toward the fact that their study was conducted with a heterogeneous sample of psychology students, as opposed to a broader sample of students. A true experimental research study would also alleviate the concern of Chen et al. (2017), which pointed to the fact that their questionnaire was only given to the students with guided notes, not all students with a more generic questionnaire. Makany et al. (2008) cite controlling extraneous variables as a need for future research. Other research has cited sample size as a limitation (Gharravi 2018).

Limitations

As noted above, the present study does not include studies with secondary-level students and other children. Konrad et al. (2009) evaluated the effect of guided notes on children. Along those same lines, there were no relevant studies on guided notes in corporate learning, in spite of the fact that some companies do use them. Furthermore, the present study only evaluates recent literature within the past 10 years and only evaluates literature in academic journals and databases. Furthermore, the present work is not a meta-analysis, as it does not statistically measure the effect size and therefore cannot give a quantifiable estimate of impact.

Conclusion

Over 40 years of research on guided notes have consistently pointed toward its effectiveness. Specifically, the aggregation of the research of the last 10 years in this study supports the initial research on guided notes and the two previous literature reviews on guided notes (Konrad et al. 2009; Larwin & Larwin 2013). Grounded in the theoretical underpinning of self-regulated learning, information processing, and generative learning, guided notes can be helpful in virtually every area important to instructors and administrators. They can improve students learning gains, promote attendance, lead to better note-taking and attendance, and increase participation. Students like guided notes and they work regardless of the branch of science or the teaching modality. The results also show that the design of the guided notes is an important factor and that guided notes are more effective with more complex content. Future research can be centered around determining the extent to which guided notes design impacts learning outcomes and identifying optimal design methodologies of the guided notes. Furthermore, research can also investigate guided notes in the online environment.

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