The Current Status of Guided Note-Taking: What We Know and What We Have Yet to Learn

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***Abstract*—This research full paper describes a systematic literature review that examines recent contributions to guided note-taking over the past five years. Guided notes, a widely used instructional strategy, involve providing teacher-prepared structured material to students during lectures to enhance learning outcomes. Almost 50 years of research have proven that guided notes can benefit learning, aid self-regulation and metacognition, alleviate cognitive load during note-taking, and scaffold generative learning. Previous reviews have shown the effectiveness of guided notes, with the last one focusing on aspects such as teaching modality, types of knowledge, content areas, participation, and attendance. Since this predates the COVID-19 pandemic, there is a need to understand how the field has evolved, especially in terms of modality.**

Inclusion and exclusion criteria for identifying relevant studies were employed. Peer-reviewed journal articles published between late 2019 and early 2024 were included, focusing on primary research addressing guided note-taking in higher education. Comprehensive searches were conducted across academic databases, such as SCOPUS, Web Of Sciences, and Taylor&Francis. The PRISMA model was followed to identify and assess eligibility and include relevant articles in the review. A table was constructed to synthesize and summarize the selected studies.

The review findings are categorized according to key aspects, including the effectiveness of guided notes in higher education disciplines, their impact on student engagement, the theoretical framework behind them, and variations in implementation. Special attention is given to emerging trends and technological innovations when delivering guided notes. The review also discusses limitations identified during the synthesis process, offering insights into aspects that require further investigation.

This systematic literature review provides a comprehensive overview of the recent progress in guided notes over the past five years, synthesizing existing literature to explore the effectiveness of guided notes across various disciplines, their impact on student engagement, the underlying theoretical frameworks, and the diverse implementation strategies observed. By analyzing the latest research findings and emerging trends in guided note-taking practices, this review offers valuable insights for educators, researchers, and organizations seeking to optimize student learning experiences and outcomes in higher education settings.

***Index Terms*—guided notes, note-taking, self-regulation, cognitive load, higher education, systematic review**

I. INTRODUCTION

Note-taking is a fundamental practice in education, serving as a vital tool for students to capture, organize, and retain information presented during lectures [1], [2]. However, the effectiveness of note-taking hinges not only on transcribing details but also on the structure and organization of the notes themselves [3], [4]. In this context, guided note-taking emerges as a strategic approach that provides students with scaffolded support and prompts to enhance their note-taking process and deepen their understanding of complex concepts [5], [6]. By offering students a framework that includes standard cues, metacognitive prompts, and designated spaces for note-taking, guided notes aim to optimize the learning experience and improve student outcomes in higher education [7], [8].

The evolution of technology and new learning methodologies has revolutionized the landscape of guided note-taking, reshaping the traditional structures and approaches used in educational settings [9], [10]. With the integration of digital tools and interactive platforms, guided notes have transitioned from static paper-based formats to dynamic, multimedia-rich resources that cater to the diverse learning preferences of modern students [11], [12]. The advent of online and hybrid learning environments, accelerated by the COVID-19 pandemic, has further propelled this transformation [13], [14].

This paper presents a systematic literature review that aims to comprehensively analyze the recent advancements and effectiveness of guided notes in higher education, particularly in light of the evolving educational landscape influenced by technological innovations and changing learning methodologies. By synthesizing existing literature and exploring emerging trends in guided note-taking practices post-COVID-19, this review offers valuable insights for educators, researchers, and organizations striving to enhance student learning outcomes and engagement in academic settings.

II. Background

A. Note-taking

Note-taking is a fundamental aspect of the learning process in higher education, with students often relying on this strategy to enhance their understanding and retention of course material. Two main functions are attributed to note-taking [15]: the encoding and the storage function. The first involves taking notes, which helps students interpret, organize, and store information, leading to improved memorization and comprehension [16]. On the other hand, the storage function emphasizes the usefulness of notes for review, aiding in the retention of key concepts and details [17].

Based on cognitive psychology, the note-taking process could be understood from several frameworks: First, note-taking serves as a *self-learning* tool, allowing students to take ownership of their learning process by actively engaging with course material. Students can identify their learning preferences through note-taking, reinforce understanding, and personalize their study strategies to enhance academic performance [18]. Second, *metacognitive* processes play a crucial role in effective note-taking by helping students monitor, regulate, and evaluate their cognitive strategies during lectures. By engaging in metacognitive reflection while taking notes, students can assess their comprehension, identify areas of confusion, and adjust their note-taking approach to improve learning outcomes [19]. Third, note-taking aligns with *information processing* theory by facilitating the encoding, storage, and retrieval of information in memory. Students engage in active processing of lecture content through note-taking, which enhances cognitive processing and promotes a deeper understanding of the material [20]. Finally, note-taking is frequently regarded as a *generative learning* technique, since rather than passively absorbing information, the brain actively constructs knowledge [19].

Several studies have provided insights into the effectiveness of note-taking strategies in higher education. A recent study [4] emphasizes note-taking as a fundamental aspect of effective learning in STEM disciplines, enabling students to interact with content outside traditional lectures and deepen their comprehension. However, the benefits of note-taking lie in how effective the technique of taking notes is. It has been established two types of techniques, linear and non-linear, where the latter can promote deeper understanding, improved retention, and enhanced academic performance compared to the former [2], [21]–[24]. Linear note-taking involves recording information in a sequential and chronological order, typically following the flow of the lecture or text. This traditional method is characterized by a structured format where notes are taken in a linear fashion from top to bottom or left to right. On the other hand, non-linear note-taking allows for more flexibility in organizing information and often uses visual representations, such as concept maps, tables, matrices, flowcharts, or diagrams, to connect ideas non-sequentially, emphasizing relationships and associations between concepts.

B. Guided Note-taking

Note-taking imposes a high cognitive load due to the complex interplay of cognitive processes involved in the task. When individuals actively listen to spoken information, they must simultaneously comprehend the content, select key points for transcription, and engage in the physical act of writing or typing [20]. One effective method for mitigating the cognitive demands associated with note-taking is through the utilization of guided notes, defined as "teacher-prepared handouts that 'guide' a student through a lecture with standard cues and prepared space in which to write the key facts, concepts, and/or relationships" by Heward in 1994 [5]. Besides the definition, some examples were shown where they clearly fit in the non-linear notes category.

Guided note-taking has emerged as a valuable strategy to enhance student learning and engagement in various educational settings. Research has demonstrated the benefits of guided notes in enhancing student engagement, comprehension, and academic performance. For instance, Montis [6] implemented guided notes in a college algebra course and observed a significant reduction in dropout rates, improved academic performance, and higher student satisfaction compared to a control group. Neef et al. [7] found similar positive outcomes in graduate students from various disciplines, including special education, psychology, and physical education, who showed enhanced academic performance and increased engagement in class activities when using guided notes. Chen et al. [8] conducted a study with psychology students and reported that those using guided notes achieved higher academic performance than peers using regular notes. The students using guided notes also demonstrated increased attention during lectures, better understanding of course material, and improved note-taking skills. Eambaipreuk et al. [25] incorporated active learning experiences through guided notes worksheets in a first-year physics course and it revealed a consistent trend of increasing mean examination scores as the intensity of active learning facilitated by the structured worksheets, which included guided note-taking sections, increased over the five-year period. This suggests that the guided notes provided scaffolding for student learning, improving student performance up to a saturation level. All these findings underscore the value of guided note-taking as an effective instructional strategy for facilitating student learning and comprehension in diverse educational contexts.

C. Purpose of the Study

There have been two guided-note meta-analyses: Konrad et al. [26] and Larwin and Larwin [27]. Both analyzed studies until 2009 based on Heward's definition of guided notes [5], revealing that guided notes were an effective strategy for improving student performance. More recently, a systematic review by Biggers and Luo [18] covered articles from 2009 to 2019, expanding and adapting Heward's definition to incorporate advancements in technology and methodology: This revised definition included "teacher-prepared materials that guide a student through a lecture with standard cues and prepared space" allowing for non-linear notes with graphic organizers or matrices, as well as their implementation in online classes. The latest systematic review included 22 studies and found that students perceived guided notes positively and demonstrated improvements in learning outcomes, especially in complex knowledge domains, irrespective of the delivery modality used.

Following the example set by Biggers and Luo in 2019, there is a growing need to analyze the current state of research on guided notes by expanding previous definitions to encompass rapid advancements in technology and evolving methodologies over the past five years, particularly considering the impact of COVID-19 pandemic on teaching and learning. For instance, in active learning methodologies, like the flipped classroom, note-taking occurs not only during the lecture but before and after, suggesting that guided notes could enhance student engagement and outcomes in pre- and post-class activities. Additionally, new approaches to guiding student learning, such as the SOAR (Select-Organize-Associate-Regulate) or WSQ (Watch-Summary-Question) strategy, involve teacher-prepared materials and a note-taking process that fall within the category of guided notes.

The purpose of the present study is to summarize research on the effect of guided notes on student outcomes in higher education settings within the past five years, using the following proposed definition of guided notes: *Teacher-prepared materials that guide or scaffold students in learning through activities before, during, or after a lecture, featuring standard cues, metacognitive prompts or questions, sentence starters and designated space for note-taking, presented in either linear or non-linear structures*. The research question addressed in this systematic review is *What are the effects of guided notes on various student outcomes?*

III. Methodology

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines [28], a widely recognized framework for systematic reviews and meta-analyses. The review involved various procedures, decisions, and considerations that directed the comprehensive analysis of the compiled list of articles.

A. Eligibility criteria

Our inclusion and exclusion criteria are:

1) Guided Note-Taking Focus: Research should primarily focus on the effect of guided notes on student outcomes in higher education settings. Studies that do not address effect-related issues or were situated in other environments, such as K-12, foreign language, or professional development, were therefore excluded;
2) Research Design: Research should comprise empirical studies presenting data derived from real observations or experiments. This excludes conceptual articles, reviews, meta-analyses, and unpublished works.
3) Language, Period and Quality: Research should be written in English and published in peer-reviewed academic journals, and dated after 2019. This ensures comprehensive analysis, maintains high quality, and integrates the latest findings. Non-English, non-peer-reviewed articles, and studies before 2019 were excluded. Conference proceedings, theses and dissertations were excluded as well to limit the number of included studies.

B. Information sources

To collect all relevant literature, this systematic review uses three prominent electronic databases: Scopus, Web Of Science, and Taylor & Francis. Using publications from these databases can boost the visibility and acknowledgment of researchers. These databases are widely respected for offering trustworthy, peer-reviewed material, ensuring abundant and secure data for analysis.

C. Search strategy

The systematic search criteria were built based on the previous reviews. The key search terms and boolean operators used were: "guided notes" OR "fill in blank notes" OR "partial notes" OR "note guides" OR "scaffold notes" OR "instructor-provided slides" OR "instructor-provided notes" OR "cloze notes" OR "skele* notes" OR "guided note-taking" OR "problem-solving worksheet" OR "guided handouts" OR "Matrix notes" OR "graphic organizer" OR "metacognitive guidance" OR "WSQ learning" AND "note-taking".

Similar to previous reviews an article did not necessarily have to explicitly mention "guided notes"; however, it was included only if the notes described in the article met the extended definition proposed for this review.

D. Selection Process

The selection process comprises three phases: identification, screening, and inclusion, aligned with the PRISMA model, as shown in the flow diagram (Fig. 1).

During the identification phase, an exhaustive search across three databases yielded 669 articles closely aligned with the research interests of this review. The selection of the 669 articles was based on the match of the key search terms in their titles, abstracts, keywords, and references. The latter to account for *snowball sampling* or reviewing other authors' citations. Automated tools were used to exclude non-peer-reviewed, non-English-language journals, conference proceedings, or publications outside the established time frame. After

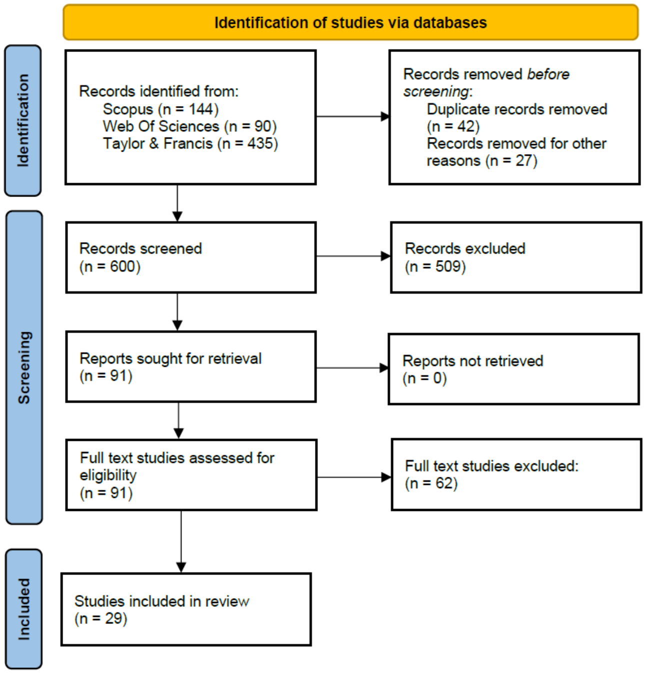

Fig. 1. PRISMA flow diagram.

the search was completed, duplicated and no-available abstract studies were excluded, resulting in 600 articles at the end of the identification stage.

At the beginning of the screening phase, studies were only excluded if the abstract did not meet the inclusion criteria; if there was any uncertainty with a result, the study was included for full-text screening. A total of 91 studies underwent full-text screening based on the inclusion criteria. At the end of this stage, 29 studies closely matched the specific criteria of the review. These included studies exhibited a high degree of relevance to the research question and ensured a comprehensive analysis of the chosen topic.

E. Data Analysis

After completing the selection process, data was gathered from each study to analyze similar information from various sources. Studies were divided into two main groups according to the definitions of guided notes used in previous reviews and the definition proposed in this review to differentiate rapid advancements in technology and evolving methodologies over the past five years. The extracted data included research design, target population, type of guided notes, and learning outcomes. This data underwent qualitative analysis to identify common themes, patterns, and connections among the selected studies.

IV. Results

Table I summarizes research on guided notes, encompassing 25 articles meeting the previous definition by Biggers and Luo [18], and Table II 4 articles meeting the proposed definition. The analysis reflects a diverse array of studies conducted over the past five years, employing various research designs from experimental to observational approaches. Sample sizes varied, spanning small-scale classroom settings to larger courses, with predominantly higher education students across different fields, particularly STEM.

Research Question: What are the effects of guided notes on various student outcomes?

A. Previous definition of guided notes

Seven out of 25 studies in Table I, include the key term "guided notes"; specifically, in their research questions about the effect on performance and perception of students.

Regarding students' performance, Lee's research [29] was conducted on the influence of guided notes and video modules on student performance metrics -including quiz scores-, perceived helpfulness, and enjoyment, within an online Applied Behavior Analysis course. Employing a pretest-posttest design, it was revealed that both guided notes and video modules proved effective in fostering knowledge acquisition among students. Kotsopoulos, D. et al. [30] implemented guided notes as a pedagogical intervention and examined their impact on student achievement, engagement, and perceptions of the learning experience. Tracking student outcomes such as pass/fail rates and academic performance, they found that students using guided notes displayed better academic performance in the course than a control group that did not use guided notes.

Ruiz, S. et al. [31] conducted a study with high-achieving graduate students in an online course of a master's degree program in behavior analysis. The study used a pretest-posttest control group design to compare the effects of guided notes on students' fact retention. The results of the study indicated statistical significance ($p < 0.01$) in performance with a medium effect size, suggesting that guided notes had a positive impact on student retention of facts. Conversely, in a similar study [32], in a hybrid graduate course in applied behavior analysis, the results indicated that guided notes did not significantly impact student scores. Both studies presented limitations such as small size and difficulty in monitoring online asynchronous tests.

As stated by Biggers and Luo [18], during the period between 1991 and 2009, only two studies addressed the online modality, and there were no studies between 2009 and 2019. In 2021 Piontkivs et al. [33] explored the impact of creating study aids and providing scaffolds for note-taking in the context of three science courses. Due to COVID-19 lockdown, one of the course shifted to fully online teaching, requiring online course development. This transition led to changes in the course delivery format, including prerecorded lectures and online discussion sections to facilitate student interaction with the instructor. Although they found similar results in the three courses, it was clear that teaching approaches and activities aiming to enhance student engagement, can be adapted to suit the different modalities. Since 2022, several studies are focused on the online modality [9], [34], noting that one reason for this shift has been the COVID-19 pandemic [25], [31].

In terms of students' perceptions, Lee [29] noted that both guided notes and video modules were perceived as helpful, although students tended to enjoy the videos more. Feudel and Panse [35] examined the effects of providing guided notes during mathematics lectures, observing and analyzing students' note-taking behaviors. Their findings indicated several positive effects of guided notes, including improved note organization, increased accuracy, enhanced attentiveness and understanding, better retention and comprehension, and reduced errors. Subsequently, the authors explored students' preferences for blanks and preprinted parts in guided notes [36], revealing a preference for guided notes with blanks for procedural exercises, step justifications, examples, and calculations, complemented by printed foundations and definitions. This preference aimed to enhance active engagement, critical thinking, and understanding in mathematics lectures, reflecting a desire for interactive and effective note-taking experiences. Similarly, Krapf and Pfefferkorn [37] investigated undergraduate mathematics students' perceptions of guided notes. They found that students perceive guided notes as beneficial for improving focus, processing new information, and encouraging active engagement. However, potential drawbacks include perceived restrictions on note-taking freedom, dependency on provided structure, and limitations in accommodating diverse learning styles.

The remaining studies in Table I did not explicitly mention the term "guided notes"; however, they exhibited characteristics indicative of both linear and non-linear instructional structures designed to support student learning. Sixteen studies featured non-linear structures, such as graphic organizers, concept maps, flowcharts, and drawing prompts. Notably, a partially self-generated graphic organizer, aligning with the concept of guided notes, was utilized across various subjects including Psychology, Chemistry, and Veterinary studies (refer to Table I). Colliot and Jamet (2019) conducted a comparative analysis [38] examining the impact of ready-made, fully self-generated, and partially self-generated graphic organizers on the learning outcomes of psychology students. Findings indicated that providing students with a partially self-generated graphic organizer significantly enhanced learning performance, with students in this group demonstrating comparable outcomes to those using ready-made organizers, and surpassing those in the fully self-generated group. This suggests that furnishing a structured framework for graphic organizer creation can optimize learning efficiency and outcomes by mitigating cognitive load. Subsequently, the authors conducted a follow-up study [39] introducing in-task guidance, where students were directed to first complete a blank graphic organizer before engaging with multimedia materials. Interestingly, when students' information processing was guided through task sequencing, those in the partially self-generated group exhibited superior memorization and comprehension compared to the control and ready-made groups. This underscores the potential of providing guided assistance during graphic organizer creation to enhance learning outcomes.

Ward's group has performed a continuous study on the effect of the instructor-provided graphic organizers as an aid to veterinary students' learning outcomes [40], [41] resulting in higher study efficiency and student satisfaction with equivalent short- and medium-term learning outcomes. Le and Morran [42] applied a graphic organizer in a second-year Organic Chemistry II course as part of a strategy to teach the design of an optimal synthetic route toward a weekly target molecule. Active engagement in constructing the graphic organizer positively impacted student outcomes, leading to improved performance on synthetic problems, enhanced understanding and application of course material, and increased efficiency in designing synthetic plans toward complex organic molecules across diverse skill levels. Flowcharts, Drawing prompts, and Matrix resulted in similar positive outcomes [9], [10], [43], [44] across several fields such as biology, chemistry, and pharmacy, among others. On the contrary, Wang [45] and Wong [11] evaluated the effect of interactive concept map task where chemistry students were provided with a partially completed concept map either in the connections (fill-in-labels) or in concepts (fill-in-concepts) but they did not find any significant improvement in student's learning.

The remaining 2 studies refer to the use of guided worksheets. Eambaipreuk et al. [50] examined the impact of incorporating worksheets with a distinct subsection on note-taking in first-year physics courses over five years. The experiments conducted involved modifying the style of worksheets and in-class activities each year to vary the intensity of active learning experiences facilitated by the worksheets. The results indicated a trend of improvement in student understanding and problem-solving skills as the intensity of active learning increased. However, the mean examination scores did not show statistically significant differences from years 2 to 5, suggesting a saturation level in the effectiveness of incorporating guided notes through worksheets on student outcomes.

B. *Proposed definition of guided notes*

Table II shows the studies where the teacher-prepared material fits better with this review's proposed definition of guided notes. Luo and Kiewra [54] explore the efficacy of the Select-Organize-Asssociate-Regulate (SOAR) strategy system in enhancing college students' synthesis writing skills through two experiments. Experiment 1, provided students with SOAR materials to aid in their synthesis writing task, while Experiment 2 extended this by examining the impact of SOAR training on synthesis writing improvement. Results indicated that students who received SOAR supplements or training exhibited improved synthesis writing abilities, including better information selection, essay organization, and inter-textual connections. The structured nature of the SOAR strategy system bears resemblance to guided notes, as both offer systematic frameworks to aid learning. While guided notes provide scaffolding for capturing key points and connections during lectures or readings, the SOAR strategy system offers a structured approach for students to select, organize, and connect information from various texts when crafting synthesis essays. In essence, both methods serve to enhance comprehension by

TABLE I
SUMMARY OF SELECTED STUDIES WITH PREVIOUS GUIDED NOTES DEFINITION

No.	Authors /Year /citacion	Research Design	Target Population	Type of guided notes	Learning outcomes (effects of guided notes)
1	Bellinger & DeCaro (2019) [46]	Experimental	Undergraduate psychology students	Cloze notes Outline notes	Outline notes, which contained fewer words compared to cloze notes, resulted in better learning outcomes, particularly in terms of free recall and inference questions.
2	Lee (2019) [29]	Experimental	Graduate psychology students	Fill-in-the-blanks notes (linear)	Guided notes and video modules proved effective for student learning, with video modules yielding notably higher quiz scores. While students favored video modules over guided notes, perceived helpfulness did not significantly differ between the two.
3	Colliot & Jamet (2019) [38]	Experimental	Undergraduate psychology students	Partially Self-generated Graphic Organizer	Partially self-generated Graphic Organizer enhanced learning outcomes, comparable to using readymade organizers and outperforming totally self-generated ones, indicating improved efficiency and outcomes through reduced cognitive load.
4	Le & Morra (2019) [42]	Quasi-experimental	Undergraduate chemistry students	Retrosynthetic (incomplete) Graphic Organizer	Completing Retrosynthetic Graphic Organizers with guidance of teaching assistans in tutorials resulted in improved understanding, enhanced synthetic planning skills, increased efficiency in designing synthetic plans, and positive pedagogical value for students
5	Miller & Bernacki (2019) [47]	Mixed methods	Preparatory undergraduate math course students	Guided notes (structures were not mentioned)	Students' engagement with guided notes as part of their self-regulated learning (SRL) behaviors was associated with proactive learning strategies and academic performance.
6	Wu (2020) [48]	Experimental	University students (STEM and humanities)	Matrix format note-taking	Matrix Note-taking significantly improved participants' online search performance by enhancing information organization, knowledge acquisition, attentional focus, and reducing off-task behavior compared to other note-taking strategies.
7	Colliot & Jamet (2020) [39]	Experimental	Undergraduate psychology students	Fill-in-the-blanks Graphic Organizer	Completing the fill-in-the-blanks graphic organizer before multimedia learning with in-task guidance enhanced memorization, comprehension, and transfer test performance, demonstrating its effectiveness in improving learning outcomes compared to other groups
8	Wang et al. (2021) [49]	Experimental	Undergraduate chemistry students	Concept maps (fill-in-lables or fill-in-concepts)	No significant differences among the groups (map-translation, fill-in-concepts, fill-in-labels) in conceptual understanding indicated by multiple-choice questions. Map-translation group significantly outperformed the fill-in-concepts and fill-in-labels groups in conceptual understanding, as indicated by open-ended questions.
9	Piontkivska et al. (2021) [33]	Observational	Undergraduate chemistry students	Table structured with empty cells	Guided notes in the form of study aid scaffolds improved exam performance, increased participation, and enhanced understanding of course material, particularly benefiting traditionally low-performing students.
10	Eambaipreuk (2021) [50]	Experimental	Undergraduate physics students	Worksheets with fill-in-the-blanks to write or draw.	Worsheet led to improved student understanding, enhanced problem-solving skills, increased engagement, and facilitated collaborative learning experiences. Worksheets evolved from focus on note-taking and problem-solving to integrating demonstrations, free-body diagrams, and interactive elements, thereby improving engagement and outcomes.
11	Wong et al (2021) [11]	Experimental	Undergraduate chemistry students	Concept maps (fill-in-lables or fill-in-concepts)	The effects of fill-in-the-labels and fill-in-the-concepts concept maps on learning outcomes were found to be less effective compared to studying static concept maps in a chemistry learning context.
12	Ward & Vengrin (2021) [40]	Mixed methods	Undergraduate veterinary students	Partially Student-generated Graphic Organizer	No significant difference in quiz scores between Student-Generated and Instructor-Provided Graphic Organizers, with students spending more time studying with Student-Generated Graphic Organizers compared to Instructor-Provided ones.
13	Kotsopoulos et al (2022) [30]	Experimental	Undergraduate calculus students	Fill-in-the-blanks notes (linear)	The use of guided notes resulted in improved student achievement, increased engagement, enhanced understanding of course material, positive student perceptions, and better note-taking skills.
14	Colliot et al (2022) [9]	Experimental	Undergraduate psychology students	Partially complete Graphic Organizer	The partially complete graphic organizer resulted in a 13% higher score on a memory test compared to a complete organizer, indicating a positive effect on student learning outcomes.
15	Feudel & Panse (2022) [51]	Mixed methods	Pre-service math teacher	Fill-in-the-blanks notes (linear)	The use of guided notes in mathematics lectures was found to enhance students' attention, understanding, engagement, organization of notes, active learning, and note-taking behaviors.
16	Krapf & Pfefferkorn (2022) [37]	Observational	Pre-service math teacher	Fill-in-the-blanks notes (linear)	Guided notes in undergraduate math courses improve student focus, processing, engagement, and lecture follow-up, yielding positive outcomes. Increasing the amount and sizes of blanks boosts cognitive engagement, retention, and active learning, enhancing overall learning effectiveness.
17	Pratiwi et al. (2022) [52]	Experimental	Undergraduate Basic Algebra students	Outline notes (structures were not mentioned)	Learning outcomes on algebra courses improved after implementing inquiry-based learning device with a guided note-taking learning model. Guided note-taking models enhanced student learning and comprehension of algebraic concepts, leading to improved academic performance
18	Ruiz et al. (2023) [32]	Experimental	Undergraduate psychology students	Fill-in-the-blanks notes (linear)	While guided notes did not significantly improve posttest exam scores, graduate students expressed a preference for using guided notes in their classes.
19	Ruiz et al. (2023) [31]	Experimental	Postgraduate psychology students	Fill-in-the-blanks notes (linear)	Guided notes improved graduate students' retention of information, studying effectiveness, test performance, ease of use, and overall positive perceptions of the learning tool.
20	Eambaipreuk et al. (2023) [25]	Experimental	Pre-service sciences teacher	Worksheets with fill-in-the-blanks to write or draw.	Worksheets in the online physics tutorial led to improved problem-solving skills, enhanced understanding of free-body diagrams, increased engagement and interaction, higher levels of learning, and positive student feedback.
21	Guo (2023) [53]	Experimental	Undergraduate students (several disciplines)	Matrix with metacognitive prompts	Matrix prompts as guided notes led to enhanced source evaluation and multiple-text comprehension outcomes compared to question prompts, emphasizing the effectiveness of structured prompts in improving students' learning in these areas
22	Waters et al. (2023) [43]	Experimental	Under and Post graduates Medical students	Drawing prompt	Drawing prompts improved students' basic understanding, retention, transfer test scores, and led to a deeper comprehension of microbiology concepts compared to those who only read the text.
23	Ward & Venegrin (2023) [41]	Mixed methods	Undergraduate veterinary students	Partially Student-generated Graphic Organizer	Student-generated graphic organizers were found to be preferred by some students and were noted to increase study efficiency compared to other study aids (instructor-provided graphic organizers, outlines, and flashcards) in an elective veterinary cardiology course.
24	Feudel & Panse (2024) [36]	Observational	Pre-service math teacher	Fill-in-the-blanks notes (linear)	Students preferred guided notes with blanks for procedural exercises, justification of steps, examples, calculations, and definitions to enhance active engagement, critical thinking, and understanding in mathematics lectures.
25	Zimmermann et al. (2024) [10]	Mixed methods	Postgraduate Pharmacy students	Flowcharts	Completing flowcharts during class sessions improved student understanding, enhanced recall and retention, facilitated content integration, and served as an efficient study tool. Students perceived completing flowcharts as beneficial for improving their understanding of key concepts, aiding in recall and retention of information

providing students with clear frameworks for processing and synthesizing information. Similarly, Chang and Hwang [55] evaluate the effectiveness of the technology-enhanced Annotation, Questioning, Summarization, and Reflection (AQSR) training approach in professional training. Particularly, in a nursing setting, through a quasi-experiment involving two classes of new nursing staff. A comparison between the AQSR-based graphic organizer approach and conventional graphic organizer-based training shows that participants using the AQSR approach exhibit significantly improved learning achievements, case analysis test scores, and more positive learning attitudes. The structured nature of the AQSR model promoted reflection, using a graphic organizer, and mirrors the concept of guided notes by providing a systematic framework for learners to engage with and deepen their understanding of the learning content, ultimately enhancing problem-solving abilities in professional training contexts.

The remaining 2 studies refer to modifications of the WSQ model [56]. Kuo et al. [57] investigated the impact of implementing a flipped classroom approach combined with the WPAQ (Watch, Peer-Summary, Assessment, Question) learning model in a Programming Design Course involving 100 students from a university in Taipei. The experimental group, utilizing the flipped classroom with the WPAQ learning mode system, demonstrated significantly better test performance, improved reflective ability, and enhanced attitudes toward programming learning than the control group following a traditional flipped classroom model. The structured peer-guided note-taking and assessment stages in the WPAQ model facilitated collaborative summarization of key points, fostering deeper understanding and engagement with the course material. This approach can be viewed as a form of guided notes, providing students with a framework for organizing information, clarifying concepts, and enhancing learning outcomes through peer interaction and collaborative learning activities. Following up on this, Kuo and Chang [12] investigated the integration of the flipped classroom approach with the WPACQ (Watch, Peer-Summary, Assessment, Correction, Question) learning model to enhance learning outcomes in programming courses, particularly focusing on algorithm units. Through a four-week experimental design involving experimental and control groups, the study found that the experimental group, utilizing the combined flipped classroom and WPACQ learning model, exhibited significantly higher learning effectiveness, motivation, self-efficacy, reflection ability, and reduced cognitive load than the control group. The guided outline note-taking and peer summarization activities within the WPACQ learning model can be seen as forms of guided notes, facilitating collaborative note-taking and a deeper understanding of instructional content. This study highlights the benefits of collaborative and guided note-taking practices and underscores the potential of the flipped classroom model for improving learning outcomes across various subjects and activities. Both studies stressed the inclusion of these models as a result of the COVID-19 pandemic's impact on implementing remote teaching.

V. Discussion

The results of this systematic review further validate the effectiveness of guided notes in enhancing student outcomes across various educational settings. The findings indicated that guided notes, when implemented thoughtfully, can significantly improve student performance, engagement, and retention of course material. Studies [25], [29], [30] demonstrated positive effects on student achievement and perceptions of the learning experience when guided notes were utilized. These results underscore the importance of incorporating structured note-taking strategies to support student learning.

The results highlighted the importance of considering the design and structure of guided notes in optimizing their effectiveness. Studies [35], [37] emphasized that guided notes can improve organization, accuracy, attentiveness, and understanding in note-taking, leading to enhanced learning outcomes. Additionally, the preference for specific guided note formats, such as blanks for procedural exercises and printed foundations for definitions, reflects students' desire for interactive and engaging note-taking experiences that promote critical thinking and active learning.

Through the lenses of self-regulation, the results demonstrated its impact on learning outcomes in various educational contexts. Self-regulated learning (SRL) skills training enhanced students' engagement with guided notes and study guides, leading to improved academic performance through effective planning and monitoring strategies [47]. Problem-solving worksheets enhanced student engagement and collaborative learning experiences, likely fostering self-regulated learning behaviors through active participation, critical thinking, and collaborative problem-solving strategies [25].

The studies' data collection emphasized the evolving nature of guided note-taking practices, with a shift towards incorporating advanced technology and innovative methodologies. This review identified a trend toward integrating digital tools, interactive platforms, and multimedia resources to enhance the delivery and effectiveness of guided notes [9], [34], [50]. By leveraging technology, educators can create more dynamic and interactive learning experiences that cater to students' diverse learning preferences and needs. Additionally, the importance of adapting guided note-taking strategies to online and hybrid learning environments, especially in the context of the COVID-19 pandemic, is highlighted [25], [31], [33].

VI. Scope of Future Work

This systematic review presents some limitations. It excluded conference proceedings,theses and dissertations to limit the number of included studies, so some relevant studies might be missed. Additionally, the present study is not a meta-analysis because it does not statistically measure effect size and, consequently, cannot provide a quantifiable estimate of the effects of guided notes.

It is worth noting that in half of the years of the time frame of the latest review, there have been a greater number of studies on guided notes. There is a need for ongoing research to explore the optimal design, implementation, and assessment

TABLE II
SUMMARY OF SELECTED STUDIES WITH PROPOSED GUIDED NOTES DEFINITION

No.	Authors /Year /citacion	Research Design	Target Population	Type of guided notes	Learning outcomes (effects of guided notes)
1	Luo & Kiewra (2019) [54]	Experimental	College students	SOAR (Select, Organize, Associate and Regulate)	SOAR strategy resulted in improved information selection, enhanced essay organization, stronger intertextual connections, knowledge transforming, and better planning and regulation skills among students.
2	Chang & Hwang (2022) [55]	Quasi-experimental	Medicine students	AQSR (Annotation, Questioning, Summarization, and Reflection)	AQSR strategy led to improved learning achievements, enhanced case analysis performance, and positive learning attitudes among new nursing staff in a professional training program.
3	Kuo et al. (2023) [12]	Expreimental	Undergraduate Programming students	WPAQ (Watch, Peer-Summary, Assessment, Question)	WPAQ resulted in improved test performance, enhanced reflective ability, positive attitudes towards programming learning, increased engagement and collaboration, and effective information organization among students.
4	Kuo & Chang (2023) [57]	Expreimental	Undergraduate Programming students	WPACQ (Watch, Peer-Summary, Assessment, Correction, Question)	WPACQ resulted in improved learning effectiveness, increased motivation and self-efficacy, enhanced reflection ability, and reduced cognitive load for learners in the experimental group.

of guided note-taking strategies in higher education. Educators are encouraged to consider factors such as student preferences, course content, and instructional goals when designing guided notes to maximize their impact on student learning outcomes. Future studies should also focus on evaluating the long-term effects of guided note-taking on student retention, transfer of knowledge, and overall academic success. By continuing to refine and innovate guided note-taking practices, educators can enhance student engagement, comprehension, and learning outcomes in higher education settings.

Most studies provide valuable insights into the effectiveness of guided notes during and after lectures, but there is a noticeable gap in exploring their effectiveness when applied before lectures for pre-class content learning. Incorporating guided notes into pre-class activities has potential benefits such as further decreasing cognitive load during these activities, enhancing self-regulated learning, and helping to engage students with pre-class assignments. Further research is needed to investigate the impact of guided notes on pre-class content learning. By addressing this gap in the literature, educators and researchers can foster a more comprehensive understanding of how guided notes can support student learning across the entire educational experience, in different disciplines, from pre-class preparation to in-class engagement and post-class reinforcement.

VII. Conclusions

This systematic literature review contributes to the current status of guided notes, highlighting the significant benefits of this instructional strategy in enhancing student learning outcomes. Over nearly 50 years of research, guided notes have consistently aided in self-regulation and metacognition, reducing cognitive load during note-taking and scaffolding generative learning. The findings underscore the effectiveness of guided notes in various educational contexts, emphasizing their role in improving student performance, engagement, comprehension, and note-taking skills. As the field continues to evolve, especially in light of the COVID-19 pandemic and advancements in technology, further research is needed to explore new modalities and approaches to guided note-taking to optimize student learning experiences.

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