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Defining Active Learning: A Restricted Systematic Review

ABSTRACT

What is active learning? While active learning has been demonstrated to have positive impacts on student learning and performance, defining the concept has been elusive. Previous research examining active learning definitions in STEM fields found that the vast majority of published articles did not define active learning, and those that did defined active learning as interacting, engaging, or not lecturing. The current research extends this STEM-focused work by examining both social science and STEM science publications. A restricted systematic review of literature was conducted using the SCOPUS database, resulting in 547 relevant articles focused on active learning from 2017 to 2022. An examination of the articles indicated that 71% of the reviewed articles did not define active learning and that the instructional strategies most often cited as fostering active learning emphasized social interactive learning strategies (e.g., small groups, team-based learning, discussion, and cooperative learning), as well as critical thinking strategies (e.g., problem-based learning, case-based learning, and inquiry-based learning). In addition, an in-depth qualitative analysis of the 161 definitions provided within the articles yielded three main emergent themes: (a) active learning is defined as grounded in student-centered constructivist theory, (b) active learning is defined as promoting higher-order thinking and deep learning, and (c) active learning is defined as an instructional strategy involving activity, participation, and engagement. Given these main findings, a representative definition was created: Active learning is a student-centered approach to the construction of knowledge focused on activities and strategies that foster higher-order thinking.

KEYWORDS

active learning, engagement, student centered, higher education, systematic review

INTRODUCTION

The concept of active learning dominates the higher education instructional landscape. With several reviews demonstrating active learning's effectiveness in improving student learning and performance (see Freeman et al. 2014; Lombardi et al. 2021; Theobald et al. 2020), active learning has come to serve as a paragon for higher education instruction. To expand and reify active learning in higher education, various colleges and universities have included active learning in their guiding principles or academic structure. For example, the University of Georgia created an Office of Active Learning at the provost level and has included active learning as the center of their accreditation Quality Assessment Plan; the University of Florida created an Active Learning Program within its interdisciplinary Center for Adaptive Innovation, Resilience, Ethic, and Science, and West Virginia University's Steelcase Active Learning Center focuses on creating flexible active learning classroom and workspaces. In

addition, active learning initiatives, programs, and institutes are common among centers for teaching and learning excellence (e.g., Columbia University, Cornell University, Iowa State University, Purdue University). Indeed, active learning, focused on instructional strategies such as problem-based learning, small group instruction, and design projects, has been posited as the pedagogical answer to the extensive use of lecture, often presented as the epitome of passive learning instruction, in higher education (Anakin and McDowell 2021; Deslauriers et al. 2019; Theobald et al. 2020).

The effectiveness of active learning, in terms of positively impacting learning and performance, was demonstrated by Freeman et al. (2014) who conducted a meta-analysis of 225 STEM-focused studies, comparing the impact of lecture versus active learning instructional approaches on exam performance and course failure rates. Freeman et al. concluded that active learning increased exam performance by almost one-half standard deviation, while decreasing course failure rates by 55%. Similarly, Theobald et al. (2020) conducted a meta-analysis of 41 studies focused on exam performance and course failure rates of students from underrepresented groups in STEM-related fields, comparing the impact of lecture versus active learning instructional approaches. They found that "active learning reduced achievement gaps in examination scores by 33% and narrowed gaps in passing rates by 45%" (6476). Finally, pre-dating Freeman et al. (2014) and Theobald et al. (2020), Hake (1998) examined a large dataset (N = 6,542), addressing the impact of lecture versus active learning on physics concept development across 62 introductory physics courses (14 lecture-based courses and 48 active learning-based courses). Hake found that an active learning approach (interactive-engagement) led to average gain scores (pre-test/post-test) on physics concept development, almost two standard deviations above the lecture-based approach. While these meta-analyses provide evidence of the positive impact of an active learning approach, the extant research is not singular in this conclusion. Bernstein (2018) examined 19 reviews and 151 individual studies focused on active learning and concluded that "a dispassionate reading of the evaluative research included in this review suggests that using [active learning] methods cannot in general assure significant benefits in terms of students' performance, especially on course examinations" (297).

While active learning has been generally demonstrated to have positive impacts on student learning and performance (Deslauriers et al. 2019; Freeman et al. 2014; Michael 2006; Prince 2004; Theobald et al. 2020), defining the concept has been elusive. For example, Nguyen et al. (2021) define active learning as, "classroom-based activities designed to engage students in their learning through answering questions, solving problems, discussing content, or teaching others, individually or in groups" (2). This common approach that active learning is activity driven aligns with one of the currently most cited definitions (see Martella, Klahr, and Li 2020) from Freeman et al. (2014): "Active learning engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert" (8413). In addition to activity-driven ones, definitions emphasizing engagement are also common: "The core elements of active learning are student activity and engagement in the learning process" (Prince 2004, 223). Thus, overall, active learning still tends to be defined the way Bonwell and Eison (1991) did, as "involving students in doing things and thinking about the things they are doing" (2)—a definition not entirely useful for developing active learning-focused instruction

and research. That said, when considering active learning definitions, Driessen et al. (2020) provide evidence that most articles do not define active learning at all.

Driessen et al. (2020) set out to examine the manner in which active learning was defined and used within the field of biology education research (BER). Driessen et al. reviewed 148 BER articles published in top BER journals between 2016 and 2018, and surveyed 105 members of the Society for the Advancement of Biology Education Research (SABER). Driessen et al. classified the peer-reviewed articles into one of six categories, based on whether each article included a definition of active learning, supported the definition with citations (i.e., literature based), and/or included active-learning strategies. The SABER survey asked participants to define active learning and list active-learning strategies they used in their classes. The literature-based and survey-based definitions and strategies were then combined. Driessen et al. found that most active learning articles did not define "active learning" (83%), and those that did provided a definition focused primarily on "interacting/engaging" or "not lecturing." In categorizing the responses from the BER society, the same two categories were emphasized—interacting/engaging and not lecturing. Similarly, in categorizing the active learning strategies provided by the reviewed articles and SABER survey, three active learning strategies were noted most often: discussion, group work, and metacognition.

RATIONALE FOR THE REVIEW

There is a general consensus that the field of higher education lacks an accepted definition of active learning and an agreed upon need to develop such an accepted definition in order to better research and apply active learning cognition and pedagogy (Bernstein 2018; Driessen et al. 2020). In addition, while there have been attempts to construct a framework and definition for active learning (see Chi and Wylie 2014; Lombardi et al. 2021), there has been no broad-scale examination of the active learning definitions that currently exist within the higher education research and pedagogy literature. The current review complements the review of Driessen et al. (2020) focusing on undergraduate biology education but is guided by a larger scope of inquiry. The central research questions addressed are:

1. How is "active learning" defined in higher education across a broad array of academic subject areas?
2. Which authors are most often cited within the active learning literature?
3. What instructional strategies are associated with an active learning pedagogy?

These research questions seek to expand on Driessen et al. to capture a larger vision of active learning in higher education. This more representative view provides a greater foundation upon which to move forward with active learning research and practice in higher education.

METHODS

To answer the three research questions, we used methods that involved data extracted from peer-reviewed active learning scholarship. These data were obtained through the use of a restricted systematic review and analyzed both quantitatively and qualitatively, depending on the research question. First, the methods involved in the search and data extraction of the restricted systematic review are addressed. Second, the methods involved in the quantitative and qualitative analyses are addressed.

Restricted systematic review

A restricted systematic review provides a rigorous approach to knowledge synthesis that involves concessions regarding depth, breadth, and process in order to generate a review more expeditiously (sometimes also called a rapid review), resulting in more cautious interpretations compared to a full systematic review. The current review aligns with the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for a systematic review (Page et al. 2021; Rethlefsen et al 2021) with adjustments based on the guidelines for a restricted systematic review (Dobbins 2017; Hamel et al. 2021; Plüddemann et al. 2018). The PRISMA 2020 guidelines were created with a quantitative health science focus in mind, although the PRISMA-S group indicates that they are appropriate for more qualitative social science foci as well, when appropriately modified (Rethlefsen et al. 2021). The PRISMA 2020 guidelines for a systematic review include a 27-item checklist. The methods outlined in this section are written to that specification, and in accordance with the guidelines, with a few exceptions. Deviations from the PRISMA 2020 guidelines to yield the current restricted systematic review are as follows: (a) only one database was queried, (b) full-text records were each assessed for inclusion by only one researcher, (c) full-text data extraction for each record was completed by only one researcher, and (d) no critical appraisal was conducted. It is important to note that a restricted review is not comprehensive and, therefore, the authors acknowledge there are existing definitions that fall outside of the parameters of this review.

Inclusion criteria

Articles were included if:

1. The term "active learning" was explicitly present in the title, abstract, keywords, or body text. Synonyms for active learning (e.g., engagement, hands-on learning, activity-based learning, or learning by doing) or instructional strategies largely considered active learning strategies (e.g., problem-based learning, design-based learning, flipped classroom, small groups) were not sufficient to be included.
2. The article and its definition of active learning was focused on higher education. Higher education was defined as any post-secondary education, including university, college, community college, and vocational/technical education.
3. The article was focused on human learning and not artificial intelligence; machine learning; mathematical, computational, or statistical modeling; natural language processing; or any form of computer programming.
4. The article must have been peer reviewed and published between 2017–2022.

Exclusion criteria

Articles were excluded if:

1. The article focused on K–12 education, preschool education, or early childhood education.
2. The language of publication was not English.

The search

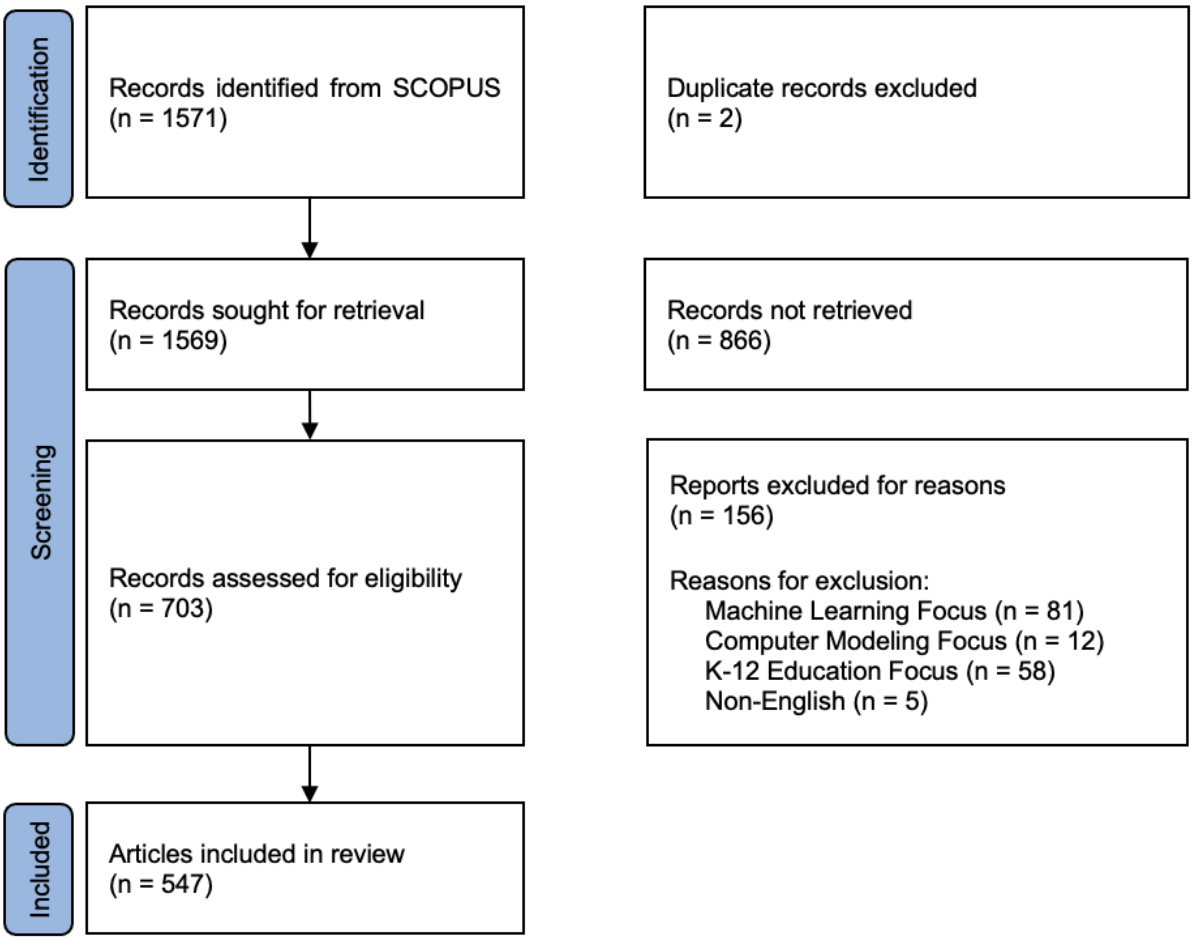
The literature search was conducted using the SCOPUS database (see Figure 1). SCOPUS was searched on March 8, 2022, using the basic form of TITLE-ABS-KEY ("active learning") with several limits applied. Limits included date range (2017–2022), publication type (journal, article, final), subject area (social science; engineering; mathematics; medicine; business, management, and accounting; physics and astronomy; decision science; biochemistry, genetics, and molecular biology; arts and humanities), and language (English), with "active learning" included and "artificial intelligence" excluded by keyword. The exact search string was:

TITLE-ABS-KEY ("active learning") AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ENGI") OR LIMIT-TO (SUBJAREA , "MATH") OR LIMIT-TO (SUBJAREA , "MEDI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "PHYS") OR LIMIT-TO (SUBJAREA , "DECI") OR LIMIT-TO (SUBJAREA , "BIOC") OR LIMIT-TO (SUBJAREA , "ARTS") OR EXCLUDE (SUBJAREA , "COMP")) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017)) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (EXACTKEYWORD , "Active Learning") OR EXCLUDE (EXACTKEYWORD, "Artificial Intelligence"))

The rationales for these search limits include:

1. The phrase "active learning" was used as both a search term and an exact keyword to keep the emphasis on articles focused on active learning and to exclude articles that simply mentioned active learning in passing.
2. Source type, document type, and publication stage were used (LIMIT-TO) to focus on peer-reviewed journal articles that had already been published to augment the quality of the search results.
3. Subject areas included (LIMIT-TO) were used to focus on the subject areas that yielded the most active learning documents, while limiting the overall number of documents in the results. An examination of these subject areas reveals that the most documents returned were from the social sciences (59%), followed by STEM fields (38%) and humanities (3%).
4. Subject area excluded (EXCLUDE) was used to limit results from "computer science" and the exact keyword excluded (EXACTKEYWORD) was used to limit results from "artificial intelligence," as the term "active learning" is used widely in computer science research related to artificial intelligence, which is irrelevant to the use of "active learning" in relation to human learning.
5. Publication year (PUBYEAR) was used to limit the search to the last five years and to focus on the current use of the term "active learning."

Figure 1. Modified PRISMA review process for the restricted systematic review



Selection criteria

The original search resulted in 1,571 records. The search results were imported to Covidence, a systematic review management software, for further analysis. In Covidence, the records were screened first for full-text availability, and then for inclusion and exclusion criteria. Full-text availability yielded 703 articles. Screening for inclusion/exclusion resulted in 156 articles being excluded: 81 articles for a machine language focus, 12 articles for computer modeling focus, 58 articles for a K–12 focus, and five articles that were not in English. Ultimately, 547 articles were selected for data extraction.

Data extraction

The extracted information from each full-text article included each article's title, author, education mode (face-to-face, hybrid, online), active learning strategies addressed (if present), and active learning definition (if present). The active learning strategies extracted were those that were directly linked to active learning (e.g., active learning involves student's engagement in problem solving or reflection), but not those that merely mentioned a strategy (e.g., in the early 1960s, social forms of instruction, such as small group work, were in vogue). The active learning definitions extracted included the sentence(s) containing the definition and any

surrounding text necessary to contextualize and comprehend the definition. In addition, during extraction, a decision was made as to which Driessen et al. (2020) category each article belonged. The four categories with definitions included: literature-based with strategies; literature-based without strategies; not literature-based with strategies; not literature-based without strategies. The two categories with no definitions included: with strategies or without strategies.

Selection decision and data extraction processes

The selection decision and data extraction processes were addressed at the same time and involved all three authors, although the ultimate selection decision and data extraction for each article was made by only one author in each case. Specifically, one of the three researchers would evaluate a full-text article to determine if the article should be included or excluded, and if the article was to be included, the appropriate information was extracted. To increase the reliability of these evaluations, all three authors evaluated the first 10 articles based on the inclusion/exclusion criteria and data extraction requirements for those articles that satisfied the inclusion criteria. Following these first 10 evaluations, the authors met to compare decisions and extractions, and discuss points of uncertainty. In addition, after each author had completed evaluations of 50 articles each, the authors again met to discuss points of uncertainty and reach consensus. Finally, during the entire evaluation process, the authors shared emails discussing any specific questions that arose regarding a specific article's selection and/or extraction. Any concerns were discussed and resolved as a team.

Extracted articles included original data studies (quantitative and qualitative) and pedagogical applications. Based on the diversity of article types, no formal quality assessments or critical appraisals were conducted.

Data synthesis

Since this review's focus is to identify how "active learning" is defined across academic domains, a narrative synthesis of the findings is used, with descriptive statistics provided to express strategy and definition classifications.

Limitations

The conducted restricted systematic review had some potential limitations. The study was focused on a subset of subject areas available in SCOPUS, addressed only published articles (no gray literature), and included only articles published in English between 2017 and 2022. These restrictions necessarily limited the articles available for study. In addition, given the broad reach of the search, there is certainly the possibility of publication bias in the articles included and excluded.

Analysis of cited authors and instructional strategies

The analysis of cited authors included a simple count of the authors referenced when active learning was defined within an article (see Table 2). These definitions may have included quoting a particular author, for example, Fragapane et al. (2018) state, "active learning 'essentially occurs when an instructor stops lecturing and students work on a question or task

designed to help them understand a concept' (Andres et al. 2021, 394)," or merely citing an author as a reference, for example, Alonso-Nuez, Gil-Lacruz, and Rosell-Martinez (2021, 1004) state, "active learning has varying definitions, but its core elements include student activity and engagement (Prince 2004)."

The analysis of the instructional strategies also included a simple count of the strategies referenced by authors as fostering or defining active learning (see Table 3). Instructional strategies were only included if they were directly linked to active learning, for example, "active learning is a broad term that includes discussion, case study, problem-based learning, and many other teaching methods" (Shinaberger 2017, 122).

Analysis of active learning definitions

The active learning definitions were analyzed qualitatively through open and focused coding in order to better understand the definitions and develop meaningful themes, patterns, and concepts (Charmaz 2006; Creswell 2013; Straus and Corbin 1990). The first two authors organized the extracted definitions and engaged in multiple readings of the data. During the readings of the data, initial themes and questions emerged, shifting the focus of analysis in multiple directions (e.g., Which theories are mentioned and applied to support active learning? Why is active learning discussed in terms of both a cognitive process and an instructional strategy? What is the relationship between engagement and participation? What makes active learning "active"?). These initial questions led to initial codings of the definitions in terms of common ideas, phrases, theories, and thoughts (e.g., active and passive, participation and engagement, referenced author commonality, specific strategy or umbrella approach). This initial coding was followed by iterative code refinement that involved a careful rereading of the definitions in light of the developing codes to verify, edit, exclude, add, and group codes. Interactive code refinement began the process of the development of relationships between the emerging themes and subthemes, as well as the extraction and integration of representative quotes. Two of the authors subsequently refined the themes and relationships, and developed interpretations based on an integration of the definitions and existing theory.

RESULTS

Defining active learning: A quantitative analysis

To address how "active learning" is defined and used across a broad spectrum of academic domains, and which strategies are deemed to foster active learning, 547 published articles explicitly addressing active learning in higher education were examined. To provide a partial replication of Driessen at el. (2020), their six categories were used to provide a general classification of the eligible articles (see Table 1). This analysis and classification resulted in 161 articles (29.4%) being classified as providing some type of "active learning" definition and 386 articles (70.5%) providing no definition. These results are somewhat less polar than those reported by Driessen et al. who found that only 16.5% of the 148 biology education articles examined provided a definition while 83.5% provided no definition.

Table 1. Classification of eligible active learning articles (N = 605)

Classification	n	%
Definition: literature-based with strategies	103	18.8
Definition: literature-based without strategies	30	5.5
Definition: not literature-based with strategies	20	3.7
Definition: not literature-based without strategies	8	1.5
No definition: with strategies	256	46.8
No definition: without strategies	130	23.8

Note: "literature-based" refers to an article including at least one citation within the definition.

Active learning definitions by author

Of the 161 active learning definitions, the 133 definitions that provided citation support (literature-based) were examined in order to identify which cited articles occurred most frequently in the definitions. A total of 241 cited articles were identified in the 133 definitions, of which 137 were unique. In examining the cited articles, only five articles were cited in at least five definitions: Prince (2004) was cited in 36 definitions, Bonwell and Eison (1991) were cited in 25 definitions, Freeman et al. (2014) were cited in 14 definitions, Felder and Brent (2009) were cited in 6 definitions, and Graffam (2009) was cited in 6 definitions. In addition, there were 122 cited articles that only appeared in one definition. It is worth noting, however, that Prince (2004) and Graffam (2009) both cited Bonwell and Eison (1991) in their definitions, thus Bonwell and Eison's definition dominates the active learning literature, explicitly or implicitly.

Finally, of the five top articles cited, at least one was cited in 55% of the definitions that provided citation support. Each of these five top articles—Bonwell and Eison (1991), Prince (2004), Graffam (2007), Felder and Brent (2009), and Freeman et al. (2014)—provided their own definition of active learning, which was often quoted or paraphrased in other definitions (see Table 2).

Table 2. Top 5 cited active learning authors and their definitions

Authors	Definition
Bonwell and Eison (1991, 2)	Active learning [is] defined as anything that "involves students in doing things and thinking about the things they are doing."
Prince (2004, 223)	Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing (Bonwell and Eison 1991).
Graffam (2007, 39)	Bonwell and Eison define active learning as "anything that involves students in doing things and thinking about the things they are doing" (1991, 2). In other words, for learning to be active, learners not only need to do something but also need to reflect on what they are doing.

Felder and Brent (2009, 2)	Active learning is anything course-related that students are called on to do other than simply watching and listening to a lecture and taking notes.
Freeman et al. (2014, 8414)	Active learning engages students in the process of learning through activities and/or discussion in class, as opposed to passively listening to an expert. It emphasizes higher-order thinking and often involves group work.

As can be seen, Bonwell and Eison (1991) provide two components to their definition of active learning, (a) "doing things," and (b) "thinking about the things they are doing." Prince (2004) and Graffam (2007) both explicitly cite Bonwell and Eison (1991), although Prince (2004) adds a third component to active learning, "engages students in the learning process." Felder and Brent (2009) and Freeman et al. (2014) also indicate that active learning involves doing, "called on to do" and "learning through activities," respectively. They also add a fourth component to active learning: it is not passively listening to a lecture.

These five definitions, jointly, paint a picture of active learning that involves (a) students engaging in and reflecting on activities (i.e., doing), and (b) not engaging in passive lecture (i.e., listening and note taking). Aspects of these five definitions—doing, reflecting, engaging, and thinking—are common among the definitions evaluated in the current study, whether or not the definitions provided citation support. For example, Payán (2021) states that active learning, "engages students in the learning process to produce meaningful learning experiences" (236), citing Prince (2004), while Hopper and Brake (2018) state that active learning, "engages students in the process of learning through activities and discussion" (685), citing both Prince (2004) and Freeman et al. (2014). Finally, elements of these five definitions can be found in the themes generated through the qualitative analysis (see Table 3).

Active learning by instructional strategy

In addition to examining the frequency of articles cited in the definitions, the instructional strategies recommended and included as fostering active learning were also examined. Across all 547 articles, 379 articles (69.2%) directly mentioned at least one active learning instructional strategy, while 168 articles (30.7%) provided no active learning instructional strategies. From the articles that included active learning instructional strategies, a total of 675 strategies were noted. These 675 strategies included 142 strategies that were mentioned only once and 48 strategies that were mentioned more than once. The 15 strategies that were mentioned at least 10 times are represented in Table 3.

Table 3. Frequency of active learning instructional strategies mentioned (N = 675)

Instructional strategy	Frequency
Problem-based learning/problem solving	64
Flipped classroom/inverted classroom	53
Small groups/group work/jigsaw	36
Team-based learning	36

Discussions	35
Case-based learning	34
Simulations	34
Cooperative/collaborative learning	29
Games/serious games/board games	27
Project-based learning	25
Clickers	17
Role playing	16
Inquiry-based learning	14
Q & A/questioning	11
Debates	10

These strategies emphasize socially interactive learning strategies (e.g., small groups, team-based learning, discussion, cooperative learning, games, role playing, questioning, and debates), as well as critical thinking strategies (e.g., problem-based learning, case-based learning, simulations, project-based learning, and inquiry-based learning). The flipped classroom was mentioned often, although the flipped classroom is more of a framework than an explicit strategy. A flipped classroom typically involves students interacting with content before class, engaging in or applying deeper processing of the content during class, and reflecting on the content after class (Kapur et al. 2022; van Alten et al. 2019). Each of these three interactions with the course content will involve a discrete instructional strategy, such as video-based instruction or reading and summarization of content before class, problem-based or inquiry-based learning of the content during class, and reflection or quizzes related to the content after class. Thus, the flipped class may be considered a framework within which other strategies are employed.

Defining active learning: A qualitative analysis

A thematic analysis of qualitative data (Kiger and Varpio 2020) was used to generate emergent themes related to defining active learning based on the reviewed articles that contained a definition, with or without the inclusion of strategies. All quotes and citations in this section refer to the articles included in the review, unless otherwise noted. As noted in the methodology, while the open coding process revealed a number of different themes that emerged from the analysis of definitions, the focused coding process led to the identification of three major themes: active learning as being grounded in student-centered constructivist theory, which speaks to the implied pedagogical orientation; active-learning as a means to promote higher-order thinking and deep learning, which speaks to the most likely outcome; and active learning as a strategy that involves participation and engagement, which speaks to the more common manifestations of the approach. While these categories are not mutually exclusive, they largely speak to the ways in which active learning is conceived—from its pedagogical orientation to the outcomes it promotes to its observable characteristics. The following narrative, therefore, provides a synthesis of how the literature reviewed conceives of and defines active learning based on those three overarching themes.

Active learning as grounded in student-centered constructivist theory

A central theme that emerged from analyzing the active learning definitions was that many authors characterized active learning as being constructivist in nature. This constructivist foundation was notably connected and intertwined with definitions of courses that were "student-centered" in nature. This connection of constructivism and student-centeredness provides a perspective that grounds active learning in a theoretical framework that prioritizes the student being active and central in the process of creating meaning, whether that meaning be through more cognitive forms of constructivism (Piaget 1950; von Glasersfeld 1989), or through more social ones (Vygotsky 1978). For instance, according to Kurtz et al. (2019), active learning "is rooted in constructivist learning theories, which posit that learning occurs best when learners actively construct their own meaning rather than passively acquiring it; new knowledge builds on previously learned knowledge; and learners engage in authentic tasks" (1). Further, the authors' constructivist approaches were seen to connect with student-centered approaches, which result in better learning. As Clarkson (2018) states, "constructivist informed active learning strategies which allow the learner to drive the acquisition of new knowledge, produce a better quality of learning than teacher centered models" (2). Furthermore, Torres, Sousa, and Torres (2018) state that "from a conceptual perspective, literature shows that there is a close relation between the concepts of constructivist learning (von Glasersfeld, 1989), student centered teaching (Lea, Stephenson, and Troy 2003), and active learning (Ljungman and Silén 2008), in the sense that responsibility for learning must be taken by the student" (577).

Within definitions that acknowledged that active learning happens when students construct their own knowledge and meaning, variations on constructivist approaches were noted, as some point to von Glasersfeld's (1989) and Piaget's (1950) ideas that knowledge is constructed by the individual, based on their own subjective and personal interpretations of their experiences (i.e., radical constructivism and cognitive constructivism, respectively), while others emphasize Vygotsky's (1978) social approach to the construction of knowledge, where knowledge and meaning are negotiated amongst and within communities (i.e., social constructivism). In relation to cognitive constructivism, Kuismaa and Nokelainena (2018) describe active learning as an "approach where students construct knowledge themselves" (3), while Abu Bakar and Ismail (2020) state that "effective learning can derive from . . . cognitive updates through an individual's active experience" (635). This knowledge construction is grounded in existing foundations of knowledge, as Roberts (2018) states that key characteristics of active learning are: "stimulation of curiosity and a desire to know more; provocation of inquiry; presentation of problems to be solved; and new knowledge construction from existing foundations of knowledge" (6). Barrett et al. (2021) indicate that constructivism can occur in an individual or collaborative setting and cite Bertsch et al.'s (2007) claim that "active learning refers to intentional (individual or collaborative) constructivist activities during which students are leveraging the cognitive process known as the generation effect" (45).

While these definitions provide connections to cognitive constructivism that focuses on the individual learners' role in the construction of knowledge and understanding, others, such as (Clark and Post 2021) invoke a more social constructivist perspective stating that learners "actively develop their understanding and practice application of knowledge and skill through interactive learning activities, discussion with their peers and teaching staff, and ultimately

learn through a process of discovery" (188). Treagust et al. (2020) provide more specificity with connecting social constructivism and active learning by identifying process-oriented guided inquiry learning (POGIL) as an example of small group active learning, based in Vygotsky's (1978) notion that the origin of knowledge construction is the interaction between people that involves sharing, comparing, and debating. Martin (2018), as well, focuses on the social nature of small group activities, stating that "active learning typically involves having students construct their understanding often as a consequence of working in small groups of peers on authentic problems aligned with relevant goals" (49). In sum, Holec and Marynowski (2020) state that "active learning is a way to engage students in the social construction of knowledge" (141).

The definitions that are grounded in constructivist theory which prioritize the role of the student, individually or socially, in the process of meaning-making, articulate that role in several ways, such as how courses are designed to foster student-centeredness, and how tools can help facilitate active engagement. Additionally, the authors describe how the complexities of what those activities are can operationalize different aspects of constructivist learning. For example, at a course design level, the flipped classroom approach, in which informational content is disseminated out of class in order to provide room for activity-based knowledge construction during class, was addressed as a course design that facilitates active learning and student centeredness. Cheng, Ritzhaupt, and Antonenko (2019) state, "The flipped classroom emphasizes the idea of problem-solving over lecture in the classroom, which is related to a number of instructional approaches that have been referred to as active learning, student-centered learning, inquiry-based learning, problem-based learning, project-based learning, and learning by doing among others" (796). Also, addressing course-level approaches, Hartikainen et al. (2019) state that "active learning is a wide concept, most often referring to student-centered and activating instructional methods and instructor-led activities. Therefore, it is generally not a concept of learning but a concept of instruction" (1). These definitions articulate a conception of active learning as a course-level approach that shifts "from input-based pedagogy, in which students are simply listening to instructors, to learner-centered pedagogy, which emphasizes student participation" (Basheer and Almazrou 2021, 319).

Beyond student-centered course designs, a reliance on tools to facilitate the types of learning environments that are student-centered and constructivist in nature was noted. For instance, although Sheth et al. (2020) describe "low-tech" possibilities for facilitating student-centered active learning, they do so while acknowledging that "several digital tools and platforms have been developed to assist [an] educator's shift from a passive, traditional, didactic lecture format towards more interactive, technology-driven active learning opportunities" (609). Additionally, Metz and Metz (2022) cite the use of multimodal strategies as a way to facilitate more active learning. They state that "active learning is a student-centered teaching technique that uses interactive, multimodal strategies to create a more engaging classroom setting compared with the traditional didactic lecture" (11). These definitions focus on the use of tools and technologies to provide options for students to become more active agents in a student-centered approach to learning.

These student-centered definitions provide opportunities for individual and social construction of knowledge. They also include definitions that are rooted in more experiential

notions of learning that have been posited by Dewey (1938). For instance, Sajidin and Ashadi (2021) describe student-centered active learning as an approach that is characterized by experiential learning and learning-by-doing pedagogy. Invoking notions of more a "hands on," experiential approach to learning, Limaymanta et al. (2021) for example, state that "active learning has its axis in pedagogy centered on the activity of the student" (134). They specifically cite student-centered activity examples, such as concept mapping, brainstorming, collaborative writing, case-based instruction, and cooperative learning. Hernández-de-Menéndez et al. (2019) state that active learning "consists of letting students be the main actors of the learning process by performing meaningful activities and critically thinking about what they are doing" (909). Finally, Calderón, Meroño, and MacPhail (2020), Okayama (2019), and Versteeg et al. (2019) all leveraged the definitions of Prince (2004) and Bonwell and Eison (1991), who explicitly focus on active learning involving student "doing," to support the idea of an activity-based active learning.

Ultimately, many of the active learning definitions are grounded in a constructivist learning perspective, acknowledging that learning happens when individuals, or groups of individuals, construct knowledge and understanding based on prior knowledge and experiences. This grounding provides a framework from which student-centered course designs can be realized by leveraging tools that facilitate more complex and nuanced ways of operationalizing active learning.

Active learning promotes higher-order thinking and deep learning

While many of the definitions grounded active learning in constructivism, others defined active learning by articulating it as a strategy that was best suited to help students achieve higher-level learning outcomes. According to Blooms' taxonomy (see Anderson et al. 2001), higher-level learning outcomes, which are situated at the top of the hierarchy, are those that are focused on helping students analyze, evaluate, and create. Examples of the types of cognitive processes that are targeted within the upper levels of the taxonomy are differentiating, organizing, critiquing, planning, and producing. Ting, Lam, and Shroff (2019) state, "the basic premise of active learning involves focusing on reinforcing higher-order thinking skills . . . requiring learners to actively participate in their learning process" (9). Additionally, Judge (2021) states that "active learning encompasses a range of techniques that involve 'learning by doing,' encourage student ownership over their own learning, and may be more suited to the development of higher-order thinking skills that entail deeper forms of learning than more passive approaches (Leston-Bandeira 2012)" (355). These definitions articulate a means by which active learning strategies are aimed at encouraging students to achieve higher-level learning outcomes, such as critical thinking, problem solving, and decision making.

Within this overarching concept of active learning as a primary mechanism for helping learners achieve higher-level learning outcomes, many of the definitions elicit specific types of higher-order thinking that can be achieved in this manner. Zoller et al. (2017) state, "active learning promotes both active discussion and critical thinking to solve complex problems and improve comprehension of complex topics" (266), and Ng et al. (2020) state, "active learning (AL) has many definitions but is generally regarded as classroom practices that engage students

in activities that promote higher-order thinking (Bonwell and Eison 1991), including analyzing, synthesizing, and evaluating the information presented rather than passively receiving it (King 1993)" (285). These definitions specifically name critical thinking, problem solving, comprehension of complex topics, analyzing, synthesizing, and evaluating as higher-level learning outcomes that can be achieved using active learning strategies.

In addition to naming some of the outcomes of active learning as a higher-order thinking facilitator, some definitions promote active learning as a means for achieving deeper learning. Clark and Post (2021), for example, state that "a key aim of active learning is to increase deep, transformative learning that can change learners' perception of the world and develop new representations of knowledge (Biggs and Tang 2011; Entwistle and Ramsden 1983; Marton and Saljo 1976; Prosser and Trigwell 1999)" (188). In accordance with this rationale, Fixen and Wald (2021) state that "active learning techniques encourage a deeper level of learning (Johnson & Johnson, 2018)" (106), while Sletten (2017) states, "learners in a classroom that supports active learning are involved in higher-order thinking skills, such as analysis, synthesis, and evaluation, and are thinking about what they are doing while they are doing these things (Bonwell and Eison 1991)" (350).

Additionally, Buitrago-Flórez et al. (2020) indicate that when students are at the center of the learning environment, they are able to better develop abilities in critical thinking, leadership, communication, and ethical decision making. The definitions that focus on the goals of active learning, therefore, address how the mechanisms of active learning strategies can create opportunities for developing higher-order thinking, problem solving, creativity, and deep learning. As stated by Yu and Husmann (2021), "fundamental to active learning is the premise that the learner constructs knowledge as opposed to receiving knowledge through a passive transaction from instructor to student (Graffam 2007) (1054). Active learning is thus defined as the student intentionally engaging in an activity to learn, making purposeful observations, and critically thinking about what they are doing."

Active learning as an instructional strategy involving activity, participation, and engagement

While being rooted in constructivist pedagogy and being well suited to accomplish higher-level learning outcomes, active learning is often defined through the lens of being an instructional strategy that involves what the students are doing behaviorally, cognitively, and/or socially. Two of the most cited definitions, Bonwell and Eisen (1991) and Prince (2004), include in their definitions references to students "doing things" or doing "meaningful learning activities," respectively. Freeman (2014) also emphasizes doing things other than passively listening to a lecture. These characteristics of students "doing things" are essential components of their definitions of active learning and provide a conceptual foundation of what active learning is by aligning with the notion of activity as a strategy that promotes learning. Zain and Sailin (2020), state: "students are not passive listeners in active learning but play active roles in learning activities; actively manipulating objects and knowledge and observing results from the learning activities (Jonassen et al. 2003)" (4952). Hayton (2017), as well, states that "active learning is stimulated in students when the activities that they are asked to perform incorporate

'doing' and processing, as well as building on learning and making connections with relevant material and concepts" (4).

This focus on activity has also been described by highlighting the need for students to participate in the learning process. Lopez-Caudana et al. (2020) state, "in active learning, the teacher uses a methodology that seeks to promote the participation of the student as a prosumer of knowledge" (4). While Pantiwati and Husamah (2017) qualify the types of participation that can be seen as active learning as any kind of activities that allow the students to participate during the instructional process. Instructional processes include interactions between students, instructor, or activities. All of these definitions point to the need for participation, which emphasizes overt, behavioral activity as a necessary condition for fostering active learning.

This need for participation is also often referred to as student engagement. For instance, Payán (2021), citing Prince's (2004) definition, states that "active learning is an instructional method that engages students in the learning process to produce meaningful learning experiences with student activity and interaction" (236). Aranha, Santos, and Garcia (2018) use both participation and engagement, and state that "engineering students' entrepreneurial skills development may occur utilizing a set of techniques, generally called active learning, that lead students to engage, participate, and conduct their own learning process" (1572). These definitions situate participation and engagement as synonymous, when considering the role of behavioral activity as a necessary component of active learning. Similar to definitions that elicit the role of participation, those that frame the active learning process by using the term engagement either use it in a general sense, or by naming strategies associated with engagement. For instance, Kutergina (2017) states, "active learning means the engagement of students in the learning process" (120), while Sugeng and Suryani (2018) state that "active learning, as an alternative to conventional teaching, engages students in educational strategies which allows them to acquire knowledge, skills, values and attitudes (Konopka et al. 2015)" (177). These definitions lean on a more general description of engagement as being critical to the active learning process. Nguyen et al. (2021), focusing more on the strategies, state "we define active learning as classroom-based activities designed to engage students in their learning through answering questions, solving problems, discussing content, or teaching others, individually or in groups" (2) and Mshayisa (2020) states that "active learning is an approach to instruction that involves actively engaging students with the course material through discussions, problem-based learning, case studies, role plays, group projects, think-pair-share, peer learning, and other methods (Michael 2004; Reitmeier 2010)" (50).

Another way in which the importance of activity, participation, and engagement has been noted is in direct comparison to lecturing. Freeman et al.'s (2014) definition explicitly notes that active learning is any learning through activity, other than passively listening to a lecture. Tayce et al. (2021) follow this theme by noting that "successful implementation of active learning strategies in class engages students in their own learning process rather than having them passively participate in a didactic lecture (Prince 2004; McKinney 2010)" (14). Cho, Melloch, and Levesque-Bristol (2021), as well, state, "Active learning can be defined as a specific instructional method that engages students in meaningful learning activities and emphasizes students' participation in activities and engagement rather than their reception of information from the instructor (Prince 2004)" (2). This definition highlights the connection between the

student-centered pedagogical approach and the role of activity and/or engagement, as opposed to passively listening to lecture, in the learning process.

The analysis of the definitions during the qualitative process elucidated themes that provide definitional clarity for the construct of active learning. Firstly, active learning is firmly situated on the theoretical and pedagogical foundation of constructivism and student-centered learning. Secondly, it is well-situated to help students reach higher-level learning outcomes and achieve deeper learning. And, building on the seminal definitions of Bonwell and Eison (1991), Prince (2004), and Freeman (2014), many definitions operationalized active learning as an approach that involves behavioral, cognitive, or social activity—students doing things and thinking things.

DISCUSSION

The current restricted review examined the definition of the concept "active learning" to capture a broad view of the perceptions of active learning across higher education. Our review revealed that only about a third of the articles examined (29.6%) provided a definition of active learning. The remaining articles (70.4%) discussed and described active learning strategies and approaches without providing a definition. Within those articles that defined active learning, five previous definitions of active learning dominated the discussion: Bonwell and Eison (1991), Prince (2004), Graffam (2007), Felder and Brent (2009), and Freeman (2014). These canonical definitions were present in more than half of the reviewed definitions and all focused on active learning involving students engaging in and reflecting on activities, not engaging in lecture. These canonical definitions subsequently had an enormous impact on how active learning was defined in higher education. In addition, when examining the instructional strategies referenced in the examined articles, the majority of these strategies focused on either social interaction (e.g., small group work, team-based learning, discussions) or critical thinking (e.g., problem-based learning, case-based learning, simulations).

A thematic analysis of the extracted definitions yielded three main findings. First, that active learning was viewed as being grounded in constructivist theory. Tenets of Jean Piaget's cognitive constructivism and Lev Vygotsky's social constructivism were cited by multiple authors who linked active, constructive ways of knowing to approaches that prioritized learners (e.g., student-centered learning). Active learning, therefore, in these instances, is a pedagogical approach that is situated on or within models that prioritize students' active construction of knowledge, either individually or collaboratively. Second, that active learning fosters higher-order thinking and deeper learning than a more passive lecture approach. When students engage in student-centered learning designed to empower them to take control of their own learning, students are more apt to engage in critical thinking, problem solving, decision making, and transformative learning. And third, that active learning, as an instructional strategy, fosters activity, participation, and engagement. Roughly 70% of the papers reviewed discussed strategies, with the most oft-cited/discussed strategies being problem-based learning/problem-solving, the flipped classroom approach, and small group discussions. Many of the definitions leaned on the concept of engagement to provide a basis for student involvement in the learning process. Many of the definitions that focus on the role of "activity" also situate that activity as being antithetical to the lecture format where students are seemingly passive recipients. Given

these main findings, a representative definition that emerged from this study is: Active learning is a student-centered approach to the construction of knowledge focused on activities and strategies that foster higher-order thinking.

This definition is similar to the one proposed by Driessen et al. (2020, 6) that sees active learning as being "an interactive and engaging process for students that may be implemented through the employment of strategies that involve metacognition, discussion, group work, formative assessment, practicing core competencies, live-action visuals, conceptual class design, worksheets, and/or games," but also extends active learning to include a pedagogical focus and an aim/goal of the approach.

Although the current analysis provides a more broad, cross-disciplinary look at foundational definitions and current practices, additional work is needed to meet the goals of increasing active learning research and encouraging application transparency and reproducibility (Driessen et al. 2020; Lombardi et al. 2021). Specifically, Lombardi et al. (2021) bring the notion of agency and observational learning into question as areas that are needed, though not typically addressed, in the literature regarding active learning. Additionally, they question whether engagement and activity are as synonymous as is typically expressed within the literature, and also whether approaches such as flipping are too broad to be considered under the same umbrella as other oft-cited, more discrete, active learning strategies (e.g., discussion, small groups, clickers). Similarly, Chi and Wylie (2014) focus on providing greater detail regarding the types of processing that occurs during active learning (interacting with others versus individual knowledge construction activities, for instance) in order to better foster student-centered cognitive engagement. Finally, Dewsbury et al. (2022) state that clear definition and implementation considerations for active learning are elusive, and advocate for acknowledging context and social-cultural approaches rooted in empathy to best address effective application of active and inclusive pedagogies that meet diverse students' needs. These approaches (Dewsbury et al. 2022; Driessen et al. 2020; Lombardi et al. 2021) make clear the need to define active learning beyond the notion of students who are doing things to learn better than those who are not.

Ultimately, there is a need to refine current definitions of active learning to move beyond simple descriptions and include a more explicit theoretical model for what active learning strategies work and in which situations. Bernstein (2018, 293) acknowledges that while meta-analyses have proven effective in general, the question of "does active learning work" should be reframed to "which active learning methods, delivered by which teachers, in which contexts, lead to educationally significant, long-term benefits for which students, and are the benefits meaningfully superior to those of traditional teaching methods?" He, therefore, calls for a more sophisticated "second generation" of research on active learning, which will require a more nuanced and theoretically focused definition. We agree.

AUTHOR BIOGRAPHIES

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