Active Learning: An Integrative Review

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INTRODUCTION

For over a century, the notion of active learning and effective student-centred instruction has been advocated for in educational research, educational reports policy, and educational values. We are familiar with theorists like Freire, Dewey, Montessori, Piaget and Vygotsky, who have built careers on this very notion. However, there is a plethora of evidence that educational systems globally fail to embrace active learning to its fullest potential. Instead, we continue to see the teacher-centred passive transmission of knowledge. It is not the purpose of this chapter to debate the active–passive divide. Instead, our goal is to explore the research

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concerning active learning in higher education over the past two decades. Admittedly, passive learning will need to be mentioned. Still, the focus is on determining the elements of active learning that appear in the research literature that promote the learning gains in higher education institutions.

Higher education institutions largely remain places of learning structured around separate disciplines and feature lectures as the key form of knowledge dissemination. These are accompanied by workshops, tutorials, labs and so on. Within these formal classes, the Lecturer/teacher engages the students in the learning process. When this engagement has the student actively involved in the learning process (Bonwell & Eison, 1991) through technology-based learning, activity-based learning, group work, or project work, we classify this as active learning. Bonwell & Eison indicate that some students and their lecturers/teachers find it challenging to learn and teach actively.

Over time, researchers have explored the teaching and learning of active learning, with the consensus that active learning results in improved learning outcomes compared to passive learning. Much of the research shows impressive learning gains in the sciences: for example, STEM failure rates fall from 32 to 21% (Freeman et al., 2014), and physics students achieved an average gain of 48% compared to 23% for traditional lecture classes (Hake, 1998). This chapter presents an integrative review of two decades of research into active learning across various disciplines. We seek to determine the essence of active learning and how this is being determined.

The Rationale for the Review

There have been several literature review projects on active learning. However, all of them are narrative reviews, and this type of review does typically not aim to examine the internal validity of the studies in focus (Toronto, 2020). We argue that research quality appraisal should form an essential part of a literature review as this helps to mitigate bias in research. To fill this gap, we conducted an integrative review to assess the methodological quality of the studies reporting active learning in higher education from 2011 to 2021. Assessing the quality or internal validity of the research reported in the integrative review is crucial (Denney & Tewksbury, 2013). The strength of our review's findings depends on the quality of the studies reviewed (Coughlan & Cronin, 2017). We have based our study on Russell's (2005) recommendation of exploring:

1. the current state of evidence of active learning
2. the quality of the evidence on active learning
3. gaps in the literature
4. future steps for active learning research and practice.

The Search

Our literature search stage utilised a comprehensive and replicable search strategy to identify our unique article set (Cooper, 1984). The process we used is presented in Fig. 2.1.
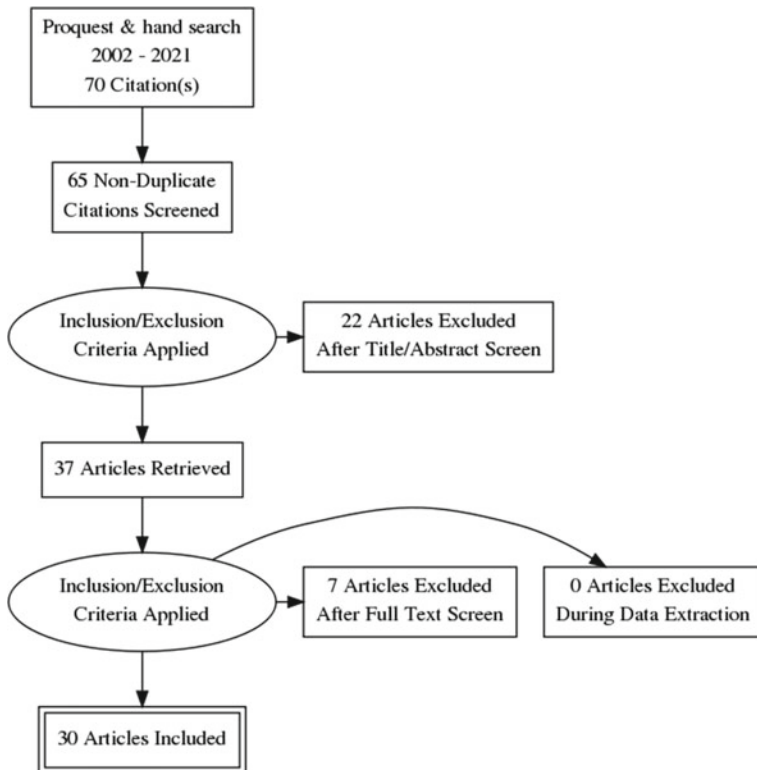

Fig. 2.1   Identification of studies via databases and hand search

We followed the systematic steps recommended by Toronto (2020, p. 2):

1. *Identifying the electronic database/s and sources*

    a. Our systematic search of the literature used predetermined criteria and allowed for replication.

2. *Developing an explicit search strategy*

    a. The inclusion criteria are
        i. Type of studies/study design: empirical
        ii. Active learning in the context of higher education
        iii. Published between 2011 and 2021
        iv. Peer reviewed
        v. Published in English
    b. The exclusion criteria are
        i. those that do not meet the inclusion criteria
        ii. review papers on active learning
        iii. articles where active learning is not presented as a term but as an adjective plus a noun phrase

3. *Screening titles, abstracts, and articles based on inclusion and exclusion criteria*

    a. Initial screening of the titles and abstracts removed 22 articles
    b. A data matrix on the author(s), year of publication, research design/methodology, the definition of active learning, and key findings was prepared, and a second screening was conducted
    c. Seven additional articles were removed from the list
    d. Reasons for exclusion were:
        i. Focus on topics other than active learning, e.g., flipped learning; student reciprocal peer teaching (e.g. Creation and Assessment of an Active e-Learning)
        ii. Did not treat active learning as a term but simply as a phrase (adjective + noun) (e.g. Creation and Assessment of an Active e-Learning Introductory ….)
        iii. Include active learning in high school education (e.g. A critical approach to active learning: A case study of two Bangladeshi colleges)
        iv. Was not empirical research (e.g. Rethinking active learning in the context of Japanese higher education)

4. *Abstracting data from selected literature in a standardised format*

    a. 30 empirical articles were analysed inductively using qualitative content analysis.

We sought theoretical frameworks about active learning to guide our analysis of the 30 articles. We wanted our analysis to reflect active learning research theories and the literature. The initial framework we located was that of The National Survey of Student Engagement (NSSE) survey, first used in 2000 and then updated in 2013. NSSE assesses students' engagement in educational practices associated with high levels of learning and development. The survey collects information across five categories. However, we found relevance in only the first two categories—participation in dozens of educationally purposeful activities, institutional requirements and the challenging nature of the coursework (NSSE, 2020). Of particular interest are the NSSE themes (academic challenge, learning with peers, and experiences with faculty) and the NSSE engagement indicators (reflective and integrative learning, learning strategies, quantitative reasoning, collaborative learning, discussions with diverse others). Engagement indicators were created by combining a theoretical and empirical analysis tested both quantitatively and qualitatively over a development process lasting several years (NSSE, 2020).

We created the *Active Learning Framework* (see Table 2.1) based on the NSSE conceptual framework of student engagement. The Active Learning Framework, derived from NSSE (2020), provided a lens to analyse the 30 articles. Table 2.1 became our conceptual framework for comprehending the various facets of student engagement as reported in the 30 articles.

The Coding and Analysis

Each of the 30 articles was analysed with a focus on the methodology and discussion sections to assess the quality of the evidence on active learning. The analysis was shaped by how active learning was defined and how the definition aligned with the Active Learning Framework.

The qualitative content analysis adapted the analytical steps of Braun and Clarke (2013):

Table 2.1 Aspects of the *active learning framework*

Content areas	Engagement indicators	Explanation
Academic challenge	Reflective & Integrative Learning	1. Combined ideas from different courses when completing assignments
		2. Connected your learning to societal problems or issues
		3. Included diverse perspectives (political, religious, racial/ethnic, gender, etc.) in course discussions or assignments
		4. Examined the strengths and weaknesses of your views on a topic or issue
		5. Learned something that changed the way you understand an issue or a concept
		6. Connected ideas from your courses to your prior experiences and knowledge
	Learning Strategies	7. Identified key information from reading assignments
		8. Reviewed course content (yournotes, lecture and tutorial ppt) after class
		9. Summarized what you learned in class or from course materials
	Quantitative Reasoning	10. Reached conclusions based on your analysis of numerical information (numbers, graphs, statistics, etc.) using IT tools
		11. Used numerical information to examine a real-world problem or issue (unemployment, climate change, public health, etc.) using IT tools
		12. Evaluated what others have concluded from numerical information

Content areas	Engagement indicators	Explanation
Learning with peers	Collaborative Learning	13. Asked another student to help you understand course material, both online and offline 14. Explained course material to one or more students, both online and offline 15. Prepared for assessments by discussing or working through course material with other students, both online and offline 16. Discuss with people from a racial/economic/religious or political background/belief other than your own, both online and offline
Experiences with faculty	Discussion of course content Discussion of academic performance	17. Discuss course topics, ideas, or concepts with a faculty member outside of class, both online and offline 18. Discuss your academic performance with a faculty member, both online and offline

1. The reading and familiarisation of each article—each article is read several times to gain an understanding of the active learning approach
2. Coding—identify phrases that captured the essence of active learning
3. Searching for themes—the frequency of codes exposed themes
4. Reviewing themes—themes and codes were scrutinised to identify subthemes
5. Defining and naming themes—terms derived from the language used by the article authors/author
6. Finalizing the analysis—themes and subthemes were considered in light of the literature cited
7. Presentation of the thematic analysis as new knowledge – new theoretical relationships were revealed.

Results

Our thematic analysis found different methodological approaches to studying and defining active learning. As indicated in Table 2.2, six articles report the study of students' behaviour and how they engage in their studies. Twenty-one articles examine the activities/tasks/strategies developed/used to generate/nurture/promote active learning. Six articles consider the theoretical approach to active learning, and two articles inform us of the impact of the environment, e.g., classroom layout and facilities.

Six articles were found to address multiple active learning approaches—Brewe et al. (2018), Gahl et al. (2021), Grossman and Simon (2020), Holec and Marynowski (2020), Hyun et al. (2017), and Mangram et al. (2015). Except for Brewe, the articles reporting on multiple active learning approaches all explored students' behaviour/skills and instructional strategies. Brewe considered both a theoretical approach and an active learning environment.

Further analysis of the 30 articles revealed three of the four engagement indicators (reflective and integrative learning, learning strategies, and collaborative learning) emphasised in the NSSE survey are commonly researched, with the fourth engagement indicator (quantitative reasoning) being the least explored indicator (see Table 2.3). Five of the articles considered just two engagement indicators, and interestingly, these five all combined reflective and integrative learning and collaborative

Table 2.2 Active learning approaches reported in reviewed articles

Active learning approaches (The study of:)	Articles
Students' behaviour/skills (6 articles)	Does it matter where you teach (Holec & Marynowski, 2020) Active learning for creating innovators (Ito & Kawazoe, 2015) Active Learning Strategies for Complementing the Lecture teaching method (Mangram et al., 2015) Perspectives on facilitating dynamic ecology courses online (Gahl et al., 2021) Students' satisfaction with their learning process in active learning (Hyun et al., 2017) Student perceptions of open educational resources video active learning exercises focusing on research reading and interpreting (Grossman & Simon, 2020) Synthesizing technology adoption and learners' approaches towards active learning in higher education (Chan et al., 2015) An experiment in active learning (Ludwig, 2021) Does it matter where you teach (Holec & Marynowski, 2020) Active-learning processes (Stewart et al., 2011) The influence of active learning practices on student anxiety in large-enrolment college science classrooms (Cooper et al., 2018) Active Learning Strategies for Complementing the Lecture teaching method (Mangram et al., 2015)

(continued)

Table 2.2 (continued)

Active learning approaches (*The study of:*)	*Articles*
Instructional strategies = Set of activities/ tools/techniques/exercises/strategies/pedagogical activities [without theory base] (20 articles)	Perspectives on facilitating dynamic ecology courses online (Gahl et al., 2021) From tootsie rolls to broken bones (Linsey et al., 2009) Applying the Plan-Do-Study-Act cycle: PDSA session (Rose et al., 2021) TBAL Technology-Based Active Learning in Higher Education (Ghilay & Ghilay, 2015) Teacher competences for active learning in engineering education (Das Neves et al., 2021) Students' satisfaction on their learning process in active learning (Hyun et al., 2017) Management strategies for active learning (Damaskou & Petratos, 2018) Perceptions on the effectiveness of active learning strategies (Daouk et al., 2016) Making it stick: use of active learning strategies in continuing medical education (Bucklin et al., 2021) Introducing sustainability into business education contexts using active learning (MacVaugh & Norton, 2012) Active learning through discussion (Lim et al., 2019) Sharing classroom research and the scholarship of teaching strategies (Walters, 2014) An introvert's perspective: analyzing the impact of active learning (William et al., 2020) Student perceptions of open educational resources video active learning exercises focusing on research reading and interpreting (Grossman & Simon, 2020)

Active learning approaches (The study of.)	Articles
Theoretical approach (6 articles)	Diverse Student Perceptions of active learning in a large enrolment STEM course (Kressler & Kressler, 2020) Costs of success: Financial implications of implementation of active learning (Brewe et al., 2018) Active learning pedagogy transformation (Fields et al., 2021) Introducing Sustainability into Business Education Contexts Using Active Learning (MacVaugh & Norton, 2012) Incoming medical students and their perception on the transition towards an active learning (Torres et al., 2019) Active learning in history teaching in higher education (Tirado-Olivares et al., 2021)
Active learning environment (2 articles)	Students' satisfaction on their learning process in active learning (Hyun et al., 2017) Costs of success: Financial implications of implementation of active learning (Brewe et al., 2018)

Table 2.3 Frequency of engagement indicators

		Engagement Indicators		
	Reflective & Integrative Learning	Learning Strategies	Quantitative Reasoning	Collaborative Learning
Number of articles	22	25	10	23
NB: Active learning is implied via activities/strategies in 2 articles				

learning. Ten articles considered three engagement indicators, and all ten included quantitative reasoning. Ten articles included all four engagement indicators.

Discussion and Conclusion

A collection of 30 unique articles published between 2002 and 2021 that fall within the topic area of active learning and satisfied the inclusion and exclusion criteria was identified and then analysed against the Active Learning Framework (Table 2.1) derived from NSSE (2020). Alignment was found to be about four of the NSSE engagement indicators: **reflective and integrative learning**, learning strategies, quantitative reasoning, and collaborative learning.

Reflective and Integrative Learning

Twenty-two articles aligned with the NSSE (2020) engagement indicator of reflective and integrative thinking. Higher education teaching and learning that emphasises reflection that relates to the learning as it occurs is known to connect the classroom with the local environment and extends to the world around them. The outcome is an examination of beliefs and values that pertain to the individual doing the reflecting and the perspectives of other people. Reflective and integrative learning was found to vary depending upon the base discipline. Reflective and integrative learning are common engagement indicators in Education and Communications, Media and Public Relations. However, the Physical Sciences, Mathematics, Computer Science; Engineering, biology, Agriculture, and Natural Resources only adopt reflective and integrative learning.

Within-disciplinary differences exist as Social Service Professions faculty consistently value reflective and integrative learning. Yet, Business have a greater diversity in the levels of importance placed on reflective and integrative learning. See Brewe et al. (2018), Bucklin et al. (2021), Chan et al. (2015), Cooper et al. (2018), Damaskou and Petratos (2018), Daouk et al. (2016), Das Neves et al. (2021), Fields et al. (2021), Gahl et al. (2021), Ghilay and Ghilay (2015), Grossman and Simon (2020), Hyun et al. (2017), Ito and Kawazoe (2015), Kressler and Kressler (2020), Lim et al. (2019), MacVaugh and Norton (2012), Mangram et al. (2015), Stewart et al. (2011), Torres et al. (2019), Tirado-Olivares et al. (2021), Walters (2014) and William et al. (2020).

Learning Strategies

Twenty-five articles aligned with the NSSE (2020) engagement indicator of learning strategies. Student learning is deepened by their active engagement with and analysing course material, rather than a surface approach to learning as absorption (NSEE, 2020). Effective learning strategies described in the 25 articles include taking notes in class and then reviewing the notes after class, summarising course material into new information, and creation of an environment conducive to learning. Active learning emphasises learning strategies as a fluid metacognitive skill resulting in students going beyond declarative and procedural knowledge to apply concepts and themes across multiple areas. See Beckerson et al. (2020), Brewe et al. (2018), Bucklin et al. (2021), Cooper et al. (2018), Damaskou and Petratos (2018), Daouk et al. (2016), Das Neves et al. (2021), Fields et al. (2021), Gahl et al. (2021), Ghilay and Ghilay (2015), Grossman and Simon (2020), Hartikainen et al. (2019), Hyun et al., (2017), Ito and Kawazoe (2015), Kressler and Kressler (2020), Lim et al. (2019), MacVaugh and Norton (2012), Mangram et al. (2015), Pundak et al. (2010), Rose et al. (2021), Stewart et al. (2011), Tirado-Olivares et al. (2021), Van Amburgh et al. (2007), Walters (2014), and William et al. (2020).

Quantitative Reasoning

Ten articles aligned with the NSSE (2020) engagement indicator of quantitative reasoning. Quantitative reasoning represents students' perceptions of how often they have engaged in activities that are thought to develop

such skills. The articles revealed quantitative reasoning to be an increasingly important outcome of higher education. Regardless of the disciplinary focus, all students should be better and more informed users of quantitative information. They should also have ample opportunities to develop their ability to reason quantitatively—to evaluate, support, and critique arguments using numerical and statistical information. See Bucklin et al. (2021), Daouk et al. (2016); Fields et al. (2021); Gahl et al. (2021); Grossman and Simon (2020), Ito and Kawazoe (2015), Linsey et al. (2009), Mangram et al. (2015), Stewart et al. (2011), and Walters (2014).

Collaborative Learning

Twenty-three articles aligned with the NSSE (2020) engagement indicator of collaborative learning. Collaborative learning is collaborating with peers, both inside and outside the classroom. The articles revealed that problem solving and the mastery of challenging content deepens student understanding and prepares students to deal with real-world unscripted problems commonly found in the workforce. Collaborative learning activities included working on group projects, seeking help with challenging content, or the flip side of explaining it to others, and the shared preparation for examinations, all indicate collaborative learning is occurring. See Brewe et al. (2018), Bucklin et al. (2021), Chan et al. (2015), Cooper et al. (2018), Damaskou and Petratos (2018), Daouk et al. (2016), Das Neves et al. (2021), Fields et al. (2021), Gahl et al. (2021), Ghilay and Ghilay (2015), Grossman and Simon (2020), Holec and Marynowski (2020), Hyun et al. (2017), Ito and Kawazoe (2015), Kressler and Kressler (2020), Lim et al. (2019), MacVaugh and Norton (2012), Mangram et al. (2015), Rose et al. (2021), Stewart et al. (2011), Tirado-Olivares et al. (2021), Walters (2014), and William et al. (2020).

Studies from the past two decades in the topic area of active learning can be generalised as critical analyses of four engagement indicators reflective and integrative learning, student learning strategies, quantitative reasoning, and collaborative learning. The approaches to studying and defining active learning can be generalised to be studies of students' behaviour and how they engage in their studies, activities/tasks/strategies developed/used to generate/nurture/promote active learning, the theoretical approach to active learning the impact of the physical learning environment.

Having determined the four methodological approaches currently utilised in researching active research from the initial thematic analysis, then followed by an analysis of 30 articles through a lens of engagement indicators (NSSE, 2020), we now want to explore how the generalisations created can fit together. We used adjacency analysis and a functional diagram (Landscape Design Validation, 2009) (see Fig. 2.2) to achieve this. The functional diagram is a matrix of intersecting pairs of elements. A symbol within the box indicates the influence between a pair of elements. The advantage of this analysis and diagram is that it provides an opportunity to question the qualities of each generalised element: What function does it perform? How does it impact other elements, enhance them or interfere with them? We based our analysis on influence—*How do each of the elements influence another?*

The analysis is conducted by reviewing each article within each generalised pair of elements and assessing them in terms of their relationship to another generalised element set of articles. A symbol placed in that pair's box indicates the assessment of that pair. A blank square indicates
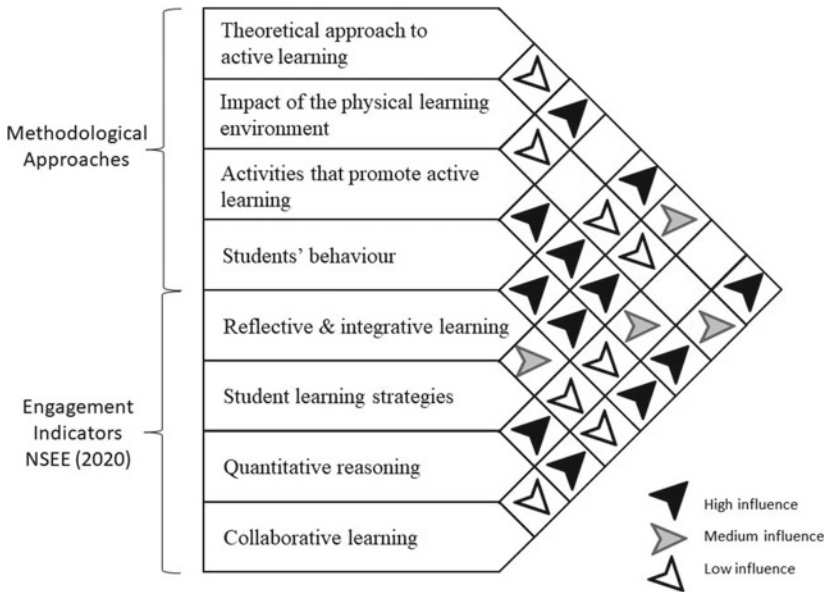

Fig. 2.2 Adjacency analysis for active learning element influence

no relationship has been determined. In Fig. 2.2, we have used a shaded-arrowhead coding system to indicate the degree of influence. An upwardly pointing black arrowhead suggests there is a high degree of influence between the pair. A sideways pointing grey arrowhead suggests there is a medium degree of influence between the pair. A downwards pointing white arrowhead indicates a low degree of influence between the pair.

The patterns that evolve provide us with a visualisation of high, medium and low influence. The four blank boxes are interesting. In the 30 articles analysed, we were unable to determine any influences between the following four pairs:

- theoretical approach to active learning and students' behaviour
- theoretical approach to active learning and quantitative reasoning
- the impact of the physical learning environment and students' behaviour
- the impact of the physical learning environment and quantitative reasoning.

The articles that included a theoretical approach did not consider students' behaviour or quantitative reasoning. Similarly, articles that had the impact of the physical learning environment did not consider students' behaviour or quantitative reasoning. Such research may exist, but it was not evident in our 30 articles over the 20 years.

Figure 2.2 indicates a high influence between pairs for 12 of the 28 element combinations. This suggests that for the eight elements that emerged from our integrative review, we have shown that 40% of the elements were reported to have a high influence on each other in terms of the student experience in active learning. A further 14% were deemed to have a moderate influence on another element. This suggests that the development of the field of active learning is maturing with a convergence of best practice and influence.

Keathley-Herring et al. (2016) inform us that a maturity characteristic rarely investigated is the relationship between academic research and typical methodological practice. We conducted a thematic analysis of the methods applied in our set of 30 articles identifying four methodological approaches (students' behaviour and how they engage in their studies, activities/tasks/strategies developed/used to generate/nurture/promote active learning, the theoretical approach to active learning the impact of

the physical learning environment). We then investigated these methodological approaches with the integrative review of the same 30 articles. This study offers a comprehensive set of elements of active learning in higher education settings. This can further guide researchers in conducting further analyses of active learning—especially about the lecturer/teaching staff, as this perspective is entirely missing in our review. The results of this integrated review suggest that the field is indeed maturing, showing a strong degree of cohesion; we seem only to have the learning perspective relating to the student. We are missing the perspective of the lecturer/teaching staff, who are learners in their own right. Devoid of research attention is the lecturer/tutor and their identity as a facilitator of active learning.

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