International Journal of Evaluation and Research in Education (IJERE)
Vol. 13, No. 3, June 2024, pp. 1850~1864
ISSN: 2252-8822, DOI: 10.11591/ijere.v13i3.26877

Active learning pedagogical dimensions: discovering and bridging the pedagogical gaps

Min Hui Leow[1], Norshahida Hassan[2], Sabrina Adia Mohd Sharizal[3], Rafiza Abdul Razak[4]
[1]Department of Asian and European Languages, Academy of Language Studies, Universiti Teknologi MARA (UiTM), Penang, Malaysia
[2]English Language Department, Faculty of Social Science, Penang Matriculation College, Penang, Malaysia
[3]Center of Research in Language and Linguistics, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, Selangor, Malaysia
[4]Department of Curriculum and Instructional Technology (CITeD), Faculty of Education, University of Malaya, Kuala Lumpur, Malaysia

Article Info

Article history:

Received Feb 18, 2023
Revised Jul 10, 2023
Accepted Aug 8, 2023

Keywords:

Active learning
Constructivist learning
Pedagogy
Student-centered learning
Systematic review

ABSTRACT

Current literatures of active learning widely address pedagogies/approaches and their outcomes, but it does not appear to be a pedagogical consensus regarding the active learning pedagogies/approaches. This situation makes it difficult to gauge the prevalence and practicability of active learning pedagogies/approaches in specific educational levels. This systematic review is aimed to find the consensus of active learning pedagogies/approaches applied in pre-school to tertiary education on the basis of constructivist philosophy and student-centered notion, determine the desirable pedagogical dimensions, discover pedagogical gaps, and offer attention for bridging the gaps. We located seven pedagogical dimensions from teachers' perspectives of pedagogical features, in terms of pedagogies/approaches and theories/concepts, from 148 publications that were eligible for inclusion after filtered through PRISMA. The learning outcomes or evidence of effectiveness were determined across various pedagogies/approaches in relation to pedagogical dimensions' manifestation. Content analysis was employed in this work to encode, categorize, and develop themes. As a result, this study highlights the pedagogical gaps between desirable pedagogical dimensions' manifestation and actual pedagogy attainment at various educational levels and provides suggestion for bridging the gaps to ensure smooth pedagogical transition. The study may serve as a foundation for future active learning pedagogical designs and enrich student-centered learning initiatives.

Corresponding Author:

Min Hui Leow
Department of Asian and European Languages, Academy of Language Studies,
Universiti Teknologi MARA (UiTM)
Cawangan Pulau Pinang, Kampus Permatang Pauh, 13500 Permatang Pauh, Pulau Pinang, Malaysia
Email: leowminhui@uitm.edu.my

1. INTRODUCTION

Today's education systems are designed in accordance with the innovative applications of 21st century teaching and learning (T&L) criteria to address global changes in education. The main goals of 21st century T&L are promoting student-centered initiatives, accelerating technological innovation, and motivating active learners to collaborate and create their own knowledge [1]. Student-centered learning encompasses methods that instructors fundamentally change their roles from being information providers to facilitators, emphasizing the importance of learners in creating their own understanding of knowledge based on individual

needs and interests [2]. Apropos to this, it is rational in addressing active learning as a component of student-centered learning [3]. The initiative of active learning is in line with the student-centered learning goals, which includes promoting learners' active participation, optimizing the educational environment, encouraging social engagement, and enrich technology utilization [4], [5]. At the same time, active learning promotes a variety of constructivist learning approaches that place emphasis on learners learning through creating their own knowledge and meanings, relating new concepts and experiences to prior information, and using metacognition to deepen understandings [6].

There are increasing numbers of studies being done specifically to investigate the active learning implementation in the education system since the year 2013 [7]. The rise in research with various perspectives reflects a wide range of concepts grounded in active learning [8]. Many active learning methods are frequently used interchangeably owing to the wide variety of concepts [9]. Additionally, it is also influenced by practitioners' conceptual coherence which they see some notions "seem to hang together" [10]. For instance, there is a multitude of pedagogical learning models for instructors to integrate active learning into contemporary T&L; the active learning pedagogies/approaches are dispersed throughout broad pedagogy studies and journals, without debating any comprehensive or integrated pedagogical consensus. Such a situation causes difficulty to reach a verdict about what are the common features that affirm the relevancy and practicability of these active learning pedagogies, in accordance with current education needs for different educational level learners. At the same time, this has caused a rise in interest in the effectiveness of different active learning pedagogies in accordance with the demands of current education. Some studies highlighted constraints or difficulties with putting active learning into practice [11], [12]. However, numerous educational premises have endorsed the application of active learning pedagogies in education because they highly believe that active learning improves student-centered learning [13]. In this context, empirical research on active learning implementation and its impacts on learning outcomes require systematic attention.

The aim of this systematic review was to determine active learning pedagogical dimensions by acquiring insight into the wide range of active learning pedagogical features in terms of pedagogies/approaches and theories/concepts currently in use, discover the pedagogical gaps between the desirable manifestation of pedagogical dimensions and actual pedagogy attainment at various educational levels, and suggest gaps bridging. Pedagogy is the teaching method or approach to teaching related to the field of education [14]; whereas pedagogical dimensions include pedagogical features that control the content and activities that learners have to perform [15]. This study gathered and synthesized the dispersed active learning pedagogies/approaches implied in different studies at various educational levels in order to discover the pedagogical consensus. This paper expects the pedagogical consensus would aid readers in understanding how the concepts of active learning are applied at various educational levels and whether there is any significant difference among the use of active learning pedagogies/approaches at different educational levels. We drew upon all relevant and necessary pedagogical features of active learning from teachers' perspectives which helped us to obtain practical data directly from practitioners and injected realism into discussion [16]. Active learning practices were then related to the fundamental concepts of active learning braced by constructivist philosophy and student-centered notion, to investigate the theoretical and conceptual dimensions of active learning pedagogies. Pedagogical consensus was identified, and it synthesized a solid or comprehensive practical and conceptual background of active learning implementation in a wide T&L area and stage.

Eventually, this study compiled active learning practices and theories/concepts that brace active learning pedagogical dimensions. We addressed the significant difference among the use of active learning pedagogies/approaches at different educational levels in the discussion of pedagogical dimensions, with the support of fundamental theories/concepts of active learning. The relationship between pedagogical dimensions and the outcomes of implementing active learning pedagogies/approaches was pinpointed. The results were used for determining the feasibility of desirable pedagogical dimensions' manifestation in specific educational levels. Finally, this study discovered the pedagogical gaps and offered attention for bridging the gaps to ensure smooth pedagogical transition which suggested instructors or instructional designers a guide for continuous growth of effective active learning pedagogies/approaches implementation from pre-school to tertiary education. To examine what exists in the literatures, the following questions were used:

- What are the most prevalent pedagogies/approaches for implementing active learning practices at present?
- What are the theories/concepts that support active learning pedagogies/approaches?
- What is the evidence of effectiveness of active learning practices?

2. THEORETICAL AND CONCEPTUAL BACKGROUND

The paradigm of "active learning" and the related concept of "student-centered" learning rose to prominence during the late 1970s and early 1980s. The "pedagogies of engagement" [17] that support active and collaborative learning have emerged since the mid-1990s, such as upside-down pedagogies, technology-

enabled active learning, team-based learning, and more [18]. In summary, student-centered learning cedes full responsibilities to the learners; protrudes active and comprehensive involvement of learners rather than passive instruction; increases sense of autonomy in the learners; builds interdependence between learners, peers, and teachers; and pays close attention to affection and cognitive domains [19], [20]. In recent years, a growing number of instructors, educators, psychologists, researchers, and instructional designers have demonstrated a consistent interest in structuring and evaluating T&L models that support learners' participation, cooperation or collaboration, and exploration. The student-centered idea has become more prominent at a time when the education system begins to apply the concept of 21st century learning in the process of T&L. According to Nahar *et al.* [21], one of the pillars of 21st century education is the incorporation of student-centered activities along with features of active learning. The construction of knowledge through student-centered learning promotes active learning among learners as well as establishes the concept of 21st century education.

It has been noted that student-centered learning and the ideas of constructivism are closely related [22]–[24]. Constructivist ideas advocate practices that lay emphasis on deep learning, discovery learning, and independent learning that encourage learners to actively construct knowledge for understanding [22], [24]. Proponents of active learning have emphasized that learning is an active process and have created metaphors for T&L that are based on "constructivist" philosophy. To elaborate further on this point, constructivist philosophy has been incorporated into the majority of studies that investigate active learning in published literature [25]–[28].

Remembering, problem solving, and making decisions based on knowledge from the past are all part of the cognitive constructivism process [29]. It gets uplifted by the surroundings which helps in the development of learners [30]. For example, a learner must attribute specific capabilities to the objects of interaction to approximately develop a reliable scheme [31]; it means a lot to a learner to have his/her experiential reality confirmed by others, which proves that social contact or communication among human plays an important role to strengthen one's thinking or knowledge that he/she has constructed [31], [32]. Thus, active learning has some connections with the social constructivist view as well, which emphasizes the value of communities in the learning process. In addition, Singhal [33] suggested that teaching practices that recruit student-centered learning should holistically take in behaviorism, cognitivism, humanism, and constructivism philosophies.

Besides, there are rich theoretical concepts embedded in the ideologies of student-centered proponents, in which the ideas have served as the foundation for many of the tenets of modern constructivist philosophy of active learning. The literature review of proponents' ideologies suggests a bunch of theoretical concepts that can be used to articulate how constructivist philosophy and student-centered notion promote the implementation of active learning pedagogies in today's teaching and learning (Appendix A: available at https://doi.org/10.17632/8gdwv9hn6s.2).

3. RESEARCH METHOD

This systematic review is constructed based on an updated Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA 2020) guidelines and checklists [34]. The PRISMA 2020 flow diagram as shown in Figure 1 illustrates the stages of this systematic review, from the initial number of identified references to the publications that were eventually excluded and included.

3.1. Inclusion, exclusion, and study selection

We conducted our electronic search in the following three databases: Scopus, Web of Science, and Education Research Complete@EBSCOhost. We believe that these three databases were the best databases for the research topic because Scopus and Web of Science are multidisciplinary databases that combine enriched data and linked scholarly literature across a wide variety of disciplines; Education Research Complete@EBSCOhost is a definitive online resource for education research, covering topics of all levels of education from early childhood to higher education, and all educational specialties. Scopus and Web of Science enabled a general search to include a wide range of related topics from high impact journals for this review. Education Research Complete@EBSCOhost enabled a discipline-specific search typically on education research and performed as a supplemented search database to ensure specific access to the related publications. Search strings consisted of the following terms, which we added "OR" within each group of key terms and added "AND" between those groups: teacher(s') AND "perspective(s) OR view(s) OR belief(s) OR perception(s) OR opinion(s) OR experience(s)" AND "active learning". We repeated the search by replacing the term "teacher" with "instructor", "lecturer", "educator", and "professor".

We followed the PRISMA 2020 protocol for screening publications with the inclusion and exclusion criteria shown in Table 1. There are a total of two rounds of screening. The first round with titles, abstracts, and keywords; the second round with the full text. In both rounds, the data were performed using an electronic data extraction table in Microsoft Excel. A numeric coding [35] of the articles was performed as "(1) included" or "(0) excluded" according to the inclusion and exclusion criteria. The publications were screened based on

the criteria Table 1: time frame of publication, peer-review, language, empirical research, field, description of pedagogy, and pedagogical outcomes. In the initial phase, publications that had been identified by automation tools as not being published within 2018 to 2022, not peer-reviewed, non-scholarly journals, not original research articles, and not being published in English were automatically eliminated. After removing the duplicates, 2746 publications remained.

Again, based on these criteria, irrelevant publications were removed by screening the titles, abstracts, and keywords. This fundamental process of review was co-defined by two researchers. There were 342 publications met the inclusion criteria; however, 47 publications were not retrieved due to inability to find the full text. The full text articles of the remaining publications were then examined separately by three researchers to determine eligibility. During the process, additional criteria were included concerning the empirical research, description of pedagogy, and pedagogical outcomes. Three researchers conducted independent screenings of the articles before discussing any discrepancies. Then, a fourth researcher was consulted to resolve disagreements until full agreement was reached. After the full text was reviewed, 148 publications were determined as eligible and included in this review.

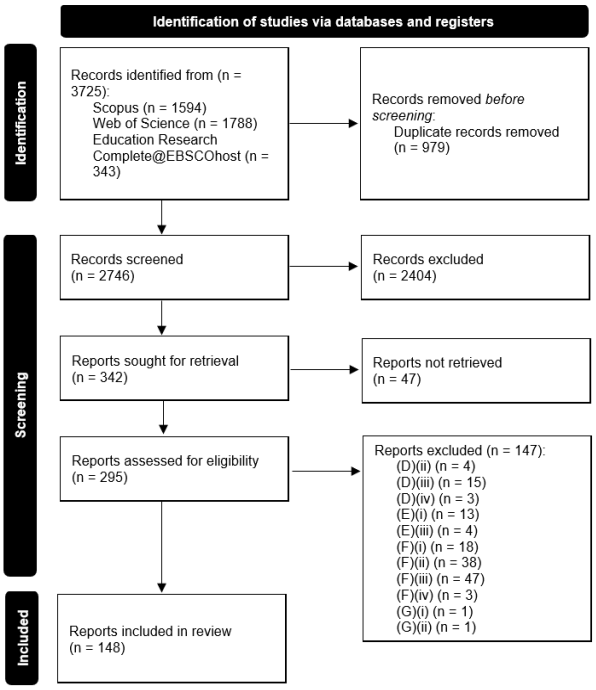


Figure 1. PRISMA 2020 flowchart

3.2. Data extraction

The details of 148 remaining publications that were further presented and analyzed in this review are listed in appendices (available at https://doi.org/10.17632/8gdwv9hn6s.2). A summary of the author, year of publication, country, research topic/discipline, field of study, data collection, and participants that recorded general information about the studies were presented in Appendix B. Information about teachers' perspectives on pedagogies/approaches they applied in their active learning practices (Appendix C) were analyzed to answer research question 1. Applicable theories/models (Appendix D) were synthesized and analyzed to answer research question 2. Subsequently, the outcomes of active learning studies (Appendix C) that aimed at proving the effectiveness of active learning pedagogies/approaches and credibility of investigating quality pedagogical dimensions were separately analyzed to answer research question 3. After that, we identified and discussed the compatibilities or consensuses between a range of pedagogies/approaches. We then mapped the comparable pedagogies/approaches onto the theoretical concepts derived from the proponents' ideology affiliations. We identified pedagogical features and grouped identical perspectives to map them onto the theoretical concepts through an iterative process of data extraction.

As a result of this process, active learning pedagogical dimensions were eventually revealed, and it was possible to gain insight into which pedagogical aspects of the current active learning practices are highly utilized, the tendency to use specific pedagogical dimensions at various educational levels, and the feasibility

to significantly demonstrate pedagogical dimensions as desirable foundation for active learning pedagogical designs in the future. This data extraction process was performed by the corresponding researcher and based on discussion with the research team. The classification was then reviewed by the entire research team and further discussed until full agreement was reached.

Table 1. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
(A) Time frame of publication	(1) Publications between 2018 to 2022 (5 years recent).	(i) Publications before 2018 and after year 2023.
(B) Peer-review	(1) Peer-reviewed original research articles which published in scholarly journals to ensure the highest level of scientific quality.	(i) Publications that have not undergone peer review. (ii) Studies published as a dissertation, proceedings of a conference, an editorial, a note, a letter, a book, a book chapter, a review, article in magazine, and article in newspaper.
(C) Language	(1) Articles published in English.	(i) Publications in other language than English.
(D) Empirical research	(1) Empirical perspectives from in-service teachers on active learning. (2) Empirical perspectives from authors who perform as teachers.*	(i) Publications that are not reporting an empirical study. (ii) Empirical studies that are not about active learning. (iii) Empirical studies that are lacking perspectives from in-service teachers on active learning. (iv) Empirical perspectives from novice/trainee/pre-service teachers (incline towards teacher training), learners, and other stakeholders.
(E) Field	(1) Studies focusing on active learning implemented in educational program, course, or module at pre-school, elementary, secondary, and tertiary level.	(i) Studies that are not focusing on active learning implemented in educational program, course, or module at pre-school, elementary, secondary, and tertiary level (e.g., training, professional development). (ii) Active learning implementation in special education due to the difference of special needs education design compared to general education. (iii) Active learning implementation in postgraduates and international learners T&L because they are more likely to be in a different experience of life and have different set of expectations.
(F) Description of pedagogy	(1) The lessons described in each study must identify themselves as adopting active learning. (2) Active learning studies that clearly describe pedagogies/approaches. (3) Active learning implementation in a general context to ensure data consistency.	(i) Studies without clear description of the lesson content and activities for active learning. (ii) Studies that put active learning as a supplementary element to discuss under a specific topic/program/model.* (iii) Studies that only measuring, evaluating, or assessing the effectiveness of active learning without specifically describing the pedagogies/approaches in use. (iv) Active learning that implemented in a specific context (e.g., COVID-19 "panicgogy" (although the global pandemic may present a chance for active learning strategies innovation, the time lack is not yet significant enough to have an impact on active learning strategies), *out-of-school context).
(G) Pedagogical outcomes	(1) Active learning studies that clearly reported the pedagogical outcomes.	(i) Active learning studies that do not clearly report the pedagogical outcomes. (ii) Active learning studies that have contradict pedagogical outcomes.*

*The inclusion and exclusion criteria were further added during the process of full-text review.

3.3. Data analysis

The research questions were examined through directed content analysis [36] to extend the active learning pedagogical features practically and conceptually. The researchers begin by identifying the significant variables (pedagogies/approaches, theories/models, and outcomes) as initial coding categories. Then, operational definitions for each category are determined using the theoretical concepts [37].

3.3.1. Analysis of pedagogical features

The pedagogical features shown in this review provide context for pedagogies in terms of what practices have been practiced and how the theories or concepts are used in practices. The pedagogical features were identified and categorized according to the types of active learning practices as well as the related theories/concepts to the practices. The lesson content and activities description of each publication was reviewed to distil the different categories of active learning pedagogies/approaches that were used to shape the desirable pedagogical dimensions. The constant comparative method of analysis [38] was applied throughout this procedure. This procedure was also carried out within active learning theories/concepts to ensure conceptual fit among pedagogical dimensions identified by the pedagogy/approach categories.

3.3.2. Analysis of outcomes and gaps

Several studies [39], [40] suggested a useful method for labeling the learning outcomes as positive (P), mixed (Mx), no significant changes (NS), and negative (N). For instance, records that indicated learning outcomes were extracted from publications and then labeled. This review applied the labeling method as in Appendix C (applied to each active learning pedagogy or approach). To identify the pedagogical gaps, trends in the learning outcomes were examined across various pedagogies/approaches of different educational levels in relation to the pedagogical dimensions' manifestation.

4. RESULTS

4.1. What are the most prevalent pedagogies/approaches for implementing active learning practices at present?

In examining the active learning implementation in the current educational system, we were able to identify groups of pedagogies/approaches that were used in different education levels or fields. Of the 148 publications examined, teachers from 113 publications provided perspectives of specific practicable pedagogies supplemented with interrelated approaches in different education levels or fields; teachers from another 35 publications generally listed the pedagogies/approaches/strategies that adequately cohered and supported the pedagogies and approaches in the 113 publications.

Table 2 shows that there is coherence of pedagogies across various educational levels or fields, indicating that those typical pedagogies are widely used in a variety of T&L contexts (extracted from Appendix C). Apart from the pedagogies in Table 2, teachers also implemented self-directed learning, digital storytelling, active seeking/screening, learning station, and competence-based learning in elementary T&L; in secondary level, teachers carried out differentiated instruction, learning with materials, culturally responsive pedagogy, and feedback as well; leaderful classroom practices, personal whiteboard learning, case-based learning, place-based learning, flexible learning, evidence-based learning, formative assessment-based active learning, and research-active/self-instruction were particularly applied in tertiary education. However, the utilization of these pedagogies was lacking in 2018-2020 active learning publications.

Table 2. Commonly used active learning pedagogies in different learning levels/fields

Specific active learning pedagogies implemented in 2018-2022	Levels/Fields				Supported by general active learning publications
	Pre-school	Elementary	Secondary	Tertiary	
Play/Free-play/Play-based learning/Games/Simulation and games/Game-based learning/Gamification	√	√	√	√	√
Inquiry-based learning/Questioning/Process Oriented Guided Learning Inquiry Learning (POGIL)	√	√	√	√	√
Project-based learning	√	√	√	√	√
Social-based learning/Cooperative learning/Team-based learning/Group learning/Small group collaboration/Collaborative interaction/Collaborative social technologies/Jigsaw technique/Interactive learning/Chatbots/Interaction technologies/Dialogic	√	√	√	√	√
Flipped learning	*√	√	√	√	√
Blended learning	*√	√	√	√	√
Outdoor/Outreach learning/Field-based learning/ Walking seminar (outdoor)	*√	√	√	√	√
Activity-based pedagogy/ Experiential learning/ Action- and doing-based learning	*√	√	√	√	√
Problem solving/Problem-based learning	*√	*√	√	√	√
Learner control pedagogy/Autonomous learning	*√	*√	√	√	√
Active thinker/ Higher-order cognitive skill (Deep learning)/ Critical thinking/ Design thinking	*√	*√	*√	√	√
Physical activity/ Physically active learning	*√	√	√	*√	√
Drama method/ Psychodramatic	*√	√		√	√
Technological learning/Cell phone-based learning/ Inquiry-based technological model/Task-based technology /Industrial robotic learning/Laptop learning/ Digital teaching/Clicker-based learning/Online learning	*√	√	*√	√	√

*The pedagogy is displayed through integrated approaches.

Based on the findings (specific & general), many teachers view pedagogies, approaches, and strategies as integrated [41], [42]. For example, project-based learning, collaborative learning, cooperative learning, problem-based learning, inquiry-based learning, and game-based learning were approaches that specifically helped to put flipped learning pedagogy into practice [43]; at the same time, these approaches served as distinct active learning pedagogies as well. Additionally, according to teachers who gave their general perspectives of

practicable active learning practices, many pedagogies/approaches/strategies were functional interchangeable. To make it more comprehensible, we synthesized all the relevant approaches that reinforce the most prevalent active learning pedagogies according to Table 2 (Appendix D).

Consequently, there were high consensus of pedagogies/approaches/strategies between publications on specific and general active learning (Elementary-63.3%; Secondary-76.9%; Tertiary-98%); however, pre-school active learning pedagogies/approaches/strategies had a low level of agreement (20%) because there were few general publications. Every approach serves a specific function in supporting active learning pedagogies, even though some are more widely utilized than others. In fact, the majority of approaches employed for active learning pedagogies at one level were also adapted to other levels. The intimate relationship and significant differences among pedagogies/approaches in various educational levels will be discussed in the coming section.

4.2. What are the theories/concepts that support active learning pedagogies/approaches?

Based on the operationalizations in the reviewed literatures, a variety of theories that brace active learning concepts and practices are presented in Appendix C. Elaborate further from the most prevalent pedagogies/approaches for implementing active learning practices, this study discovered a set of essential active learning pedagogies/approaches that were utilized at all educational levels, creating a uniform active learning setting across all educational levels. The findings displayed a strong concordance between the ideas found in publications at all educational levels and the theoretical concepts put out by proponents of active learning in Appendix A. Among the consensus, the theoretical concepts that have received significant attention across various educational levels are presented in Table 3.

Table 3. Essential theoretical concepts shared among all educational levels

Focus of prevalent pedagogies/approaches	Theoretical concepts	Pedagogical dimension
Autonomous	Learner control; sense of control	Internalization (motivation)
Individual achievement and independent learning	Intrinsic motivation; motive; learning with happiness, interest, curiosity, needs, and desire; interest and nature of curiosity; independence; individuality; inner direction; self-determination; self-regulation	Internalization (motivation)
Student-centered	Learner control	Internalization (motivation)
Practical/application	Action-in-context; experiential learning; *construct knowledge or development of mind	Environmental interaction
Hands-on	Hands-on; learning from experience; experiential; investigation	Environmental interaction
Peer learning	Interaction and communication; social participation; sharing role; social activities and collaborative arrangement; peer teaching/learning; reciprocal dialogue; social relationship; positive relationships, interaction, and cooperation within communities; warm relationship; peer learning; *learner control (autonomous pairing); *freedom (free communication); * reflective thinking (peer grading)	Environmental interaction
Authentic/experiential learning	Authentic and active experience; learning in context; learning from the environment; interaction between learners and surroundings; interact with the environment; interact with the surroundings for exploration	Environmental interaction
Activities with equipment	Learning with materials (include technology tools)	Environmental interaction
Movement	Movement and cognition are closely entwined; *active manipulation of materials or objects	Environmental interaction
Differentiation and equity	Individuality; differentiation; diversity; sharing role; equity; integrated	Opportunity
Free choice and flexibility	Freedom; flexible; self-determination; democratic; *nature, homely, and harmonious learning environment; *the project method	Opportunity
Scaffolding instruction	Development of mind; learning as a process	Continuity
Friendly competition	Extrinsic motivation	Continuity

*Complementary theory/concept

After synthesizing and analyzing the prominent shared theories, the findings proved that the bulk of studies that examine active learning in literature adhere to the constructivist ideology [25]–[28], containing both cognitive and social constructivist theories. Besides, active learning theory, student-centered theory, and activity theory serve as the foundation for active learning practices that highlight the "student-centered" feature. In line with Singhal view [33], behaviorism (self-regulation and motivation) and humanism (attribution theory and personal causation) philosophies play significant role in supporting student-centered learning practices. Regarding the supporting theories, the environmental/situated theory encourages the idea that learners learn more effectively when the activities are based on real-world experiences, whereas the outcome-based theory

bases active learning around goals. Apart from the active learning concepts that are corresponding to the concepts given by proponents, we came across a fresh concept that places a strong emphasis on "technology-based". Technology must be taken into account in the framework of T&L in the 21st century [44].

On the other hand, several pedagogies/approaches had been applied in different manners at different levels of education, supported by theoretical concepts advanced by proponents of active learning. The outcomes showed a gradual progression of simple to complex pedagogies/approaches across different educational levels. The details are shown in Table 4.

Table 4. Gradual-progression theoretical concepts in various educational levels

Focus of pedagogies/ approaches	Theoretical concepts				Pedagogical dimension
	Pre-school	Elementary	Secondary	Tertiary	
Play	Sensorial learning; learning with re-sources; order in the learning environment; free development through play; construct know-ledge; nature development (free play).	free development through play; learning in context (free play within basic context)	free development through play; learning in context (play within context)	free development through play; learning in context; learning with materials; active manipulation of materials or objects (e.g., technology) [skillful play]	Meaningful play
Imitation	Learning in context (performance)	Learning in context; warm relationship; development of mind; internalized discovery (internalized)	-	Learning in context; warm relationship; development of mind; internalized discovery (psychodrama)	Meaningful play
Thinking activity	Critical thinking; logical thinking; higher order thinking (basic training of HOTS)	Critical thinking; logical thinking; higher order thinking; reflective thinking; discover and organize knowledge; construct knowledge; nature development/ cognitive development by stages (HOTS application)	Critical thinking; logical thinking; higher order thinking; construct knowledge; nature development/ cognitive development by stages; create meaning of knowledge; creativity (Creative)	Critical thinking; logical thinking; higher order thinking; construct knowledge; nature development/ cognitive development by stages; create meaning of knowledge; creativity (Invite new ideas)	Meaning-making and thinking
Problem solving, task-based, and project-based learning	Working on projects; problem solving [basic]	Working on projects; creativity, invention, and re-invention; problem solving (creative and invention)	Working on projects; creativity, invention, and re-invention; problem solving (creative and invention)	Working on projects; problem solving; learning in context (e.g., case-based) [directional]	Meaning-making and thinking
Inquiry-based learning	Learning as inquiry [basic question loop]	Learning as inquiry; higher order thinking (HOTS)	Learning as inquiry; higher order thinking; reciprocal dialogue (reciprocal)	Learning as inquiry; higher order thinking; reciprocal dialogue (variety of permutations in questioning)	Meaning-making and thinking
Discovery and exploration	Movement and cognition are closely entwined; discovery; space and relation (designated discovery)	Movement and cognition are closely entwined; active discovery; space and relation; learning from the environment; constant searching from the surroundings; investigation (outdoor learning)	Movement and cognition are closely entwined; active discovery; space and relation; learning from the environment; constant searching from the surroundings; investigation (outdoor learning)	Movement and cognition are closely entwined; active discovery; space and relation; learning from the environment; constant searching from the surroundings; investigation (place-based/field work)	Discovery
Reflection	Reflection and evaluation (designated assessment)	Reflection and evaluation; social interaction; reciprocal dialogue; reflective thinking; internalized discovery (designated assessment, peer feedback, and self-reflect)	Reflection and evaluation; social interaction; reciprocal dialogue; reflective thinking; internalized discovery (designated assessment, peer feedback, and self-reflect)	Reflections and evaluations; critical reflection; internalized discovery (critical reflection)	Discovery

4.3. What is the evidence of effectiveness of active learning practices?

Different trends in learning outcomes were investigated among active learning pedagogies/approaches at different educational levels (Appendix C). There were 77.8% (n=7) of the publications that implemented active

learning practices at the pre-school level reported positive outcomes; 22.2% (n=2) reported mixed outcomes. In elementary level, 24.3% (n=9) of the publications reported positive outcomes; 73% (n=27) publications reported mixed outcomes; and 2.7% (n=1) reported negative outcomes. In secondary level, 17.9% (n=7) publications reported positive outcomes; 79.5% (n=31) publications reported mixed outcomes; and 2.6% (n=1) publications reported negative outcomes. In tertiary level, 28% (n=23) publications reported positive outcomes; 72 % (n=59) publications reported mixed outcomes. Overall, the data materials provided cumulative evidence of effectiveness that assists in allocating the credibility of pedagogical dimensions (Appendix C). Although the evidence of effectiveness that supports the applicability of pedagogical dimensions tended to be encouraging, the high tendency of "mixed outcomes" indicated the presence of pedagogical gaps that needed to be addressed further.

5. DISCUSSION

5.1. Main findings

This study grouped interrelated pedagogies/approaches and theories/concepts together, which resulted in the identification of seven pedagogical dimensions (four sharing dimensions and three gradual-progression dimensions) that serve as desirable active learning foundation. Then, we dove deeper into the pedagogical gaps that could impede the smooth pedagogical transition for attaining the desirable pedagogical dimensions. The identified gaps cover any factor that impedes desirable pedagogical dimensions' manifestation, even if some learners were able to obtain desired outcomes in the context yet some learners were not. The investigation of pedagogical gaps was then followed by pragmatic suggestions for bridging gaps Figure 2.

A highly endorsed pedagogical dimension shared across different educational levels is internalization. From a humanism perspective, internalization involves elements such as beliefs or consciousness, attitudes, standards, and opinions which determine the consistency of learning outcomes in terms of self-determination and sense of self. Active learners are expected to have a natural drive to self-regulate an important but displeasing matter [45]. According to the findings, however, learners' lack of confidence to be self-motivated and self-directed [46]–[48] and fear of failure [46], [49] during active learning created a gap between the conventional-contemporary pedagogical transition at each educational level. Consequently, the pedagogical gap within the internalization dimension would ultimately affect other pedagogical dimensions' ideal manifestation, such as learners feel stress while accomplishing meaning-making activities [50], not confident, shy, and afraid of sharing opinions or feedback in environmental interaction [46], [51], and so on. This study suggests an adaptation of pedagogy of confidence to bridge the gap, advocated by Jackson and Feuerstein [52] based on cognition theory. It is advised that instructors identify learners' background, strengths or outstanding achievements, allow for mistakes, offer enrichment and scaffolding, cultivate close bonds, and amplify learners' voices.

Another pedagogical dimension shared across different educational levels identified in this review is environmental interaction, which is also given considerable emphasis by proponents of active learning and can be argued with broad knowledge construction process through interaction between human (peer and community), natural (environment), and human-made components (materials/tools) [53]. Social constructivism advocates that social interaction can strengthen thinking or knowledge that one's has constructed [31], [32]. However, there are issues occurring during peer engagement in terms of learners' personal-social pedagogical transition and collaborative skills; these situations are often found in young learners and secondary school learners' active learning. The personal-social pedagogical transition problem made learners difficult for contributing themselves in their peer groups, as if they were quickly lost in the conversation [54]–[56], and it was challenging for them to come up with insightful ideas that resulting in less meaningful discussion [57], [58], even though they have higher attainment while learning by themselves.

Additionally, insufficient collaborative skills even resulted in less reciprocal questioning or debates [59] and learners often require prompting to initiate conversation and transfer their understanding convincingly to their peers [59], [60]. Consequently, this circumstance widens the gap between social-based learning in lower-level and higher-level educational contexts. This study suggests gradual familiarization with peer interaction, in which learners start their learning from personal pedagogy that teaches them about their learning needs, strengths, skills, and interests; next, they move on to pair or small group interactions to foster spontaneous interaction; finally, learners shift to more complex group discussion.

On the other hand, it is anticipated that tertiary education learners would function cognitively like adults [61], and previous studies included in this review clearly demonstrated that those learners show better personal-social pedagogical transition and higher collaborative skills. Nonetheless, the issue of integrating contemporary learning environment and pedagogic material interaction emerged, as the learning environment transitioned from the conventional to the digital. Young adult learners who are digital immigrants showed stronger resistance to change [62] compared to young learners. In any case, strengthening digital literacy skills

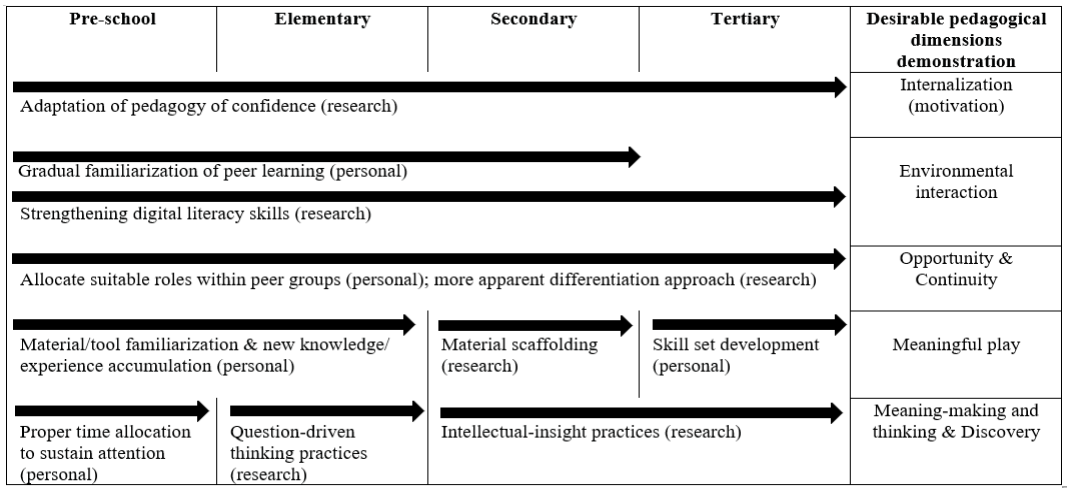
is crucial for learners at every level to bridge the transition to the modern learning environment [63] because technology provides a significant interaction purpose in addition to being an informational tool [64].

Opportunity and continuity are both related pedagogical dimension shared across different educational levels. First, opportunity is braced by the theoretical concepts of flexibility [65], freedom [66], [67] and equity [68]. Free-choice/free-play [69], free communication [70], dynamic learning [71], and differentiated learning [72] were some of the methods used by teachers to give learners equal learning opportunity. On the basis of opportunity, it assures learning continuity as if learners fairly compete in the context and take full responsibility for the entire learning process. Nonetheless, the pedagogical gap emerged due to learners' diversity which permeated all educational levels. Despite the diversity of young learners, secondary and tertiary school learners have a greater sense of self-esteem to perform themselves [73]; they prefer to work on their own if given the chance [51]. Furthermore, divergent learners often refuse to work together [55], leaving behind lower cognitive and lower emotionally engaged learners who need learning support [48]. Due to unequal opportunities, it consequently discourages the continued learning of disadvantaged learners. This study emphasizes the gradual familiarization with peer interaction once more to bridge the pedagogical gap; on top of that, it is important to allocate suitable roles within peer groups that are most appropriate for each learner. Additionally, the differentiation approach used in the active learning classroom should be more apparent considering the features of content, process, product, and environment [74].

Meaningful play is one of the gradual-progression pedagogical dimensions that demands attention to pedagogical gaps in each educational level to ensure continuous level-to-level pedagogical growth. Plays and games were popular pedagogies/approaches used by instructors [75], [76]; resulting in enjoyment, active hands-on or experience, high engagement and motivation, and other benefits [77], [78]. Pedagogical gap was found since pre-school and elementary level learners lack of prior knowledge or experience with certain learning tools in plays [79], indicating that at this early developmental phase, material or tool familiarization and new knowledge or experience accumulation is essential during free play. At the secondary level, plays become more challenging as they incorporate increasingly complicated contexts, diverse work divisions, and time allocation to meet higher expectations for low-intermediate pedagogical transition. The inability of learners to solve problems and achieve desired learning outcomes led to the discovery of a pedagogical gap [80]. Material scaffolding depending on the learners' different developmental level is essential to bridge the gap at this level [81]. Plays for the tertiary level have optimal level of difficulty, challenges, and uncertain goal attainment [82]. Pedagogical gap appeared when learners lack the necessary skill set to take on challenges in plays [83], suggesting the necessity for skill set development at this moment to bridge the gap.

Meaning-making and thinking and discovery, two connected pedagogical dimensions that support learners' knowledge construction initiatives, are further aspects of gradual-progression pedagogical dimensions. Rousseau declared that a child would have his own reason to investigate and explore the natural world actively [84], that is where meaning-making starts. However, young learners have a short attention span when engaging in thinking activities [85], [86], similar to what Piaget [87] urged, resulting in a decrease in learning interest and motivation [88]. Although elementary learners are expected to have more advanced thinking skills than preschoolers, they still have difficulty in understanding questions, providing direct answers, and coming to decisions [89]; even throughout the discovery process, they are unlikely to develop a critical grasp of the resources' strengths and weaknesses, as well as self-awareness [90]. According to Table 4, pre-school learners are expected to be a beginning thinker who just need basic thinking skills that foster a nature response to criticism and feedback [91], [92]. To close the pedagogical gap, time should be allocated in a way that sustains the attention of learners and encourages the nature development of higher internal standards of clarity, logic, and accuracy. Whereas elementary learners are anticipated as practical thinkers who can evaluate their reasoning in a systematic manner [91], [92]. This study suggests question-driven thinking practices [91], [92] to guide elementary leaners in better interpreting information to make inferences.

Surprisingly, the use of active learning pedagogies nowadays does not ensure effective meaning-making and thinking skills, even for secondary and tertiary learners. Both learner groups were found to be underperformed in deep and critical thinking [93], [94] as well as developing one's own way of thinking [51], [95]. Higher-level education is frequently plagued by issues that are similar to those young learners' encounter, such as a lack of motivation in critical thinking [96] and a lack of cognitive preparation to conduct independent thinking and discovery [46], [97]. This demonstrated that a failure to bridge the pedagogical gap at an early stage of learning may have major consequences later on, leading to a negative pedagogical transition. Given that secondary and tertiary learners are anticipative advanced thinkers, this study offers intellectual-insight practices to help learners who are attempting to be thorough come to the best decision, create a new thought pattern, and act in accordance with their best judgement [91], [92].



Note. The suggestions for bridging pedagogical gaps were either from the researchers (personal) or supported by research (research)

Figure 2. Framework for bridging pedagogical gaps

5.2. Limitations

Based on the demarcations already indicated, difficult compromises in the literature search and inclusion or exclusion process were noted. Even though access to publications from various continents is made available, the search was done for articles in English only, the potential of articles is still limited. The requirements for the articles' selection in journals according to specific criteria, especially teachers' perspectives were restricting. For example, publications that recorded teachers' perspectives are respectively lesser than students' voices; pre-school teachers' perspectives are respectively lesser than other T&L fields or levels. As a result, the quality of publications was given precedence over completeness. From the analysis, there were a great variety of pedagogies, approaches, and concepts. It could be difficult to discern between categories because some of them could be interpreted as either hierarchical or overlapping. A wide range of topics or disciplines was presented in the publications, with more than a quarter from Science, Technology, Engineering and Mathematics (STEM). This review found a large number of consensuses between pedagogies/approaches in different disciplines, but there is no denying that some disciplines tend to frequently employ particular pedagogies/approaches. Despite the fact that this review included publications from different countries, we were incapable of distinctly defining the tendency of specific use of active learning pedagogies/approaches based on different country's educational system. Thus, the way of developing a balanced depth and full breadth in the categorization was prioritized at the most prevalent features.

5.3. Implication

The review can be described as a holistic study for the research field, to provide insight into the most prevalent active learning pedagogies/approaches at present, relating theories/concepts, and the evidence of effectiveness of the practices. The pedagogical dimensions we identified can serve as a reference for teachers or instructors to appropriately understand the fundamental pedagogical features grounded in various active learning practices before/when putting them into practice. The pedagogical dimensions provide a basis for active learning pedagogical designs to a greater extent that comprehensively cover the most related, applicable, and contemporary features essential for optimal active learning implementation in different T&L levels or fields. This study reveals that it is important to determine the features that demonstrate the relevancy and practicability of active learning practices in light of the current demand for student-centered learning.

Besides, this study presents significant similarities and differences on the usage of pedagogical dimensions at different educational levels. Hence, this study lays a foundation for future research by conducting studies that focus on evaluating the functionality of pedagogical dimensions in the use of active learning at various levels or different fields. Future studies should anticipate different kinds of consensuses based on different disciplines and educational systems. Additionally, this study draws attention to pedagogical gaps within pedagogical dimensions and provides personal and research-supporting suggestions to bridge the gaps. This encourages further research to validate the outcomes provided by this study. On the basis of applying the pedagogical dimensions, further modification of current active learning practices is therefore required. Future research that aimed for innovative active learning pedagogical designs for teachers or instructors' practical support are encouraged.

6. CONCLUSION

This review gives an overview of teachers' perspectives regarding active learning implementation at different educational levels. We claimed that there is a lack of discussion about pedagogical consensus in contemporary research. Therefore, this study started with a broad investigation into the active learning pedagogical features and identified the outcomes across various educational levels or fields. Consequently, there were coherences between pedagogical features and outcomes, leading to the emergence of seven pedagogical dimensions that essentially applied to all educational levels or fields. In our context, we summarized the pedagogical dimensions as internalization, environmental interaction, opportunity, continuity, meaningful play, meaning-making and thinking, and discovery. By using these dimensions as a common reference for the development of active learning design and implementation, the relation between pedagogies/approaches, theories/concepts, and outcomes was pinpointed more distinctly compared to general active learning application. Furthermore, this study discovered significant differences in the pedagogical dimensions applied at different educational levels and suggested attention to bridge the pedagogical gaps. To put it briefly, this study has broadened and deepened the research domains of earlier studies by offering concern to bridge the gaps and ensure smooth pedagogical transition. This study can be used as a resource for the ongoing improvement of student-centered learning initiatives.

REFERENCES

[1] L. Sumardi, A. Rohman, and D. Wahyudiati, "Does the teaching and learning process in primary schools correspond to the characteristics of the 21st century learning?" *International Journal of Instruction*, vol. 13, no. 3, pp. 357–370, Jul. 2020, doi: 10.29333/iji.2020.13325a.

[2] B. L. McCombs and J. S. Whisler, *The learner-centered classroom and school: Strategies for increasing student motivation and achievement*. Jossey-Bass Inc., 1997.

[3] S. J. G. Gordon, C. F. Bolwell, J. L. Raney, and N. Zepke, "Transforming a didactic lecturer into a student-centered active learning exercise – Teaching equine diarrhea to fourth-year veterinary students," *Education Sciences*, vol. 12, no. 2, Jan. 2022, doi: 10.3390/educsci12020068.

[4] D. A. Tholibon *et al.*, "The factors of students' involvement on student-centered learning method," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 11, no. 4, pp. 1637–1646, Dec. 2022, doi: 10.11591/ijere.v11i4.22314.

[5] E. Gallou and P. Abrahams, "Creating space for active learning: (Opportunities from) using technology in research-based education," in *Shaping Higher Education with Students*, UCL Press, 2018, pp. 165–175. doi: 10.2307/j.ctt21c4tcm.27.

[6] J. D. Bransford and A. L. B. R. Cocking, *How people learn: Brain, mind, experience, and school*. National Academies Press, 1999.

[7] R. Talbert and A. Mor-Avi, "A space for learning: An analysis of research on active learning spaces," *Heliyon*, vol. 5, no. 12, Dec. 2019, doi: 10.1016/j.heliyon.2019.e02967.

[8] M. L. Stanberry, "Active learning: a case study of student engagement in college Calculus," *International Journal of Mathematical Education in Science and Technology*, vol. 49, no. 6, pp. 959–969, Aug. 2018, doi: 10.1080/0020739X.2018.1440328.

[9] R. H. Shroff, F. S. T. Ting, W. H. Lam, T. Cecot, J. Yang, and L. K. Chan, "Conceptualization, development and validation of an instrument to measure learners' perceptions of their active learning strategies within an active learning context," *International Journal of Educational Methodology*, vol. 7, no. 1, pp. 201–223, Feb. 2021, doi: 10.12973/ijem.7.1.201.

[10] G. L. Murphy and D. L. Medin, "The role of theories in conceptual coherence.," *Psychological Review*, vol. 92, no. 3, pp. 289–316, 1985, doi: 10.1037/0033-295X.92.3.289.

[11] M. Cohen, S. G. Buzinski, E. Armstrong-Carter, J. Clark, B. Buck, and L. Reuman, "Think, pair, freeze: The association between social anxiety and student discomfort in the active learning environment.," *Scholarship of Teaching and Learning in Psychology*, vol. 5, no. 4, pp. 265–277, Dec. 2019, doi: 10.1037/stl0000147.

[12] S. Hood *et al.*, ""I like and prefer to work alone': Social anxiety, academic self-efficacy, and student's perceptions of active learning," *CBE—Life Sciences Education*, vol. 20, no. 1, Mar. 2021, doi: 10.1187/cbe.19-12-0271.

[13] R. M. Lima, P. H. Andersson, and E. Saalman, "Active learning in engineering education: a (re)introduction," *European Journal of Engineering Education*, vol. 42, no. 1, pp. 1–4, Jan. 2017, doi: 10.1080/03043797.2016.1254161.

[14] R. K. Shah, *Revisiting concept, definition, and forms of pedagogy*. GlobeEdit, 2021.

[15] B. Gros, "Game dimensions and pedagogical dimension in serious games," in *Handbook of Research on Serious Games for Educational Applications*, IGI Global, 2017, pp. 402–417. doi: 10.4018/978-1-5225-0513-6.ch019.

[16] D. S. Rentner, N. Kober, and M. Frizzell, *Listen to us: Teacher views and voices*. Center on Education Policy (CEP), 2016.

[17] K. A. Smith, S. D. Sheppard, D. W. Johnson, and R. T. Johnson, "Pedagogies of engagement: Classroom-based practices," *Journal of Engineering Education*, vol. 94, no. 1, pp. 87–101, Jan. 2005, doi: 10.1002/j.2168-9830.2005.tb00831.x.

[18] P. Baepler, J. D. Walker, D. C. Brooks, K. Saichaie, and C. I. Petersen, *A guide to teach in the active learning classroom*. Sterling, VA: Stylus Publishing, 2016.

[19] G. Gibbs, *Assessing student centred courses*. UK: Oxford Centre for Staff Learning and Development, 1995.

[20] S. J. Lea, D. Stephenson, and J. Troy, "Higher education students' attitudes to student-centred learning: Beyond 'educational bulimia'?" *Studies in Higher Education*, vol. 28, no. 3, pp. 321–334, Aug. 2003, doi: 10.1080/03075070309293.

[21] N. Nahar *et al.*, "Active learning through student-centred activity in the instruction of Islamic education teachers as an implementation of the 21st century learning: A case study," *International Journal of Academic Research in Business and Social Sciences*, vol. 11, no. 11, Nov. 2021, doi: 10.6007/IJARBSS/v11-i11/11586.

[22] O. Carlile and A. Jordan, "It works in practice but will it work in theory? The theoretical underpinnings of pedagogy," in *Emerging issues in the practice of university learning and teaching*, AISHE, 2005, pp. 11–26.

[23] J. W. Neumann, "Developing a new framework for conceptualizing," *The Educational Forum*, vol. 77, no. 2, pp. 161–175, Apr. 2013, doi: 10.1080/00131725.2012.761313.

[24] S. Tangney, "Student-centred learning: a humanist perspective," *Teaching in Higher Education*, vol. 19, no. 3, pp. 266–275, Apr. 2014, doi: 10.1080/13562517.2013.860099.

[25] K. Hood Cattaneo, "Telling Active Learning Pedagogies Apart: from theory to practice," *Journal of New Approaches in Educational Research*, vol. 6, no. 2, pp. 144–152, Jul. 2017, doi: 10.7821/naer.2017.7.237.

[26] P. Pardjono, "Active learning: The Dewey, Piaget, Vygotsky, and constructivist theory perspectives," *Jurnal Ilmu Pendidikan*, vol. 9, no. 3, pp. 163–178, 2016.
[27] S. M. Swiderski, "Transforming principles into practice: Using cognitive active learning strategies in the high school classroom," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, vol. 84, no. 6, pp. 239–243, Oct. 2011, doi: 10.1080/00098655.2011.590549.
[28] M. Walshaw, "A powerful theory of active engagement," *For the Learning of Mathematics*, vol. 24, no. 3, pp. 4–10, 2004.
[29] E. Remmel, "Constructing cognition," *American Scientist*, vol. 96, no. 1, pp. 80–82, 2008, doi: 10.1511/2008.69.80.
[30] V. Bhagat, M. Haque, and K. Jaalam, "Enrich schematization in children: Play as the tool for cognitive development," *Journal of Applied Pharmaceutical Science*, vol. 8, no. 7, pp. 128–131, Jul. 2018, doi: 10.7324/JAPS.2018.8720.
[31] E. von Glasersfeld, "Cognition, construction of knowledge, and teaching," *Synthese*, vol. 80, no. 1, pp. 121–140, Jul. 1989, doi: 10.1007/BF00869951.
[32] J. S. P. Hirtle, "Coming to terms: Social constructivism," *English Journal*, vol. 85, no. 4, pp. 91–92, 1996.
[33] D. D. Singhal, "Understanding student-centered learning and philosophies of teaching practices," *International Journal of scientific research and management*, Feb. 2017, doi: 10.18535/ijsrm/v5i2.02.
[34] M. J. Page *et al.*, "The PRISMA 2020 statement: an updated guideline for reporting systematic reviews," *BMJ*, Mar. 2021, doi: 10.1136/bmj.n71.
[35] J. Saldana, *The coding manual for qualitative research*. United States: SAGE Publications, 2021.
[36] H.-F. Hsieh and S. E. Shannon, "Three approaches to qualitative content analysis," *Qualitative Health Research*, vol. 15, no. 9, pp. 1277–1288, Nov. 2005, doi: 10.1177/1049732305276687.
[37] W. J. Potter and D. Levine-Donnerstein, "Rethinking validity and reliability in content analysis," *Journal of Applied Communication Research*, vol. 27, no. 3, pp. 258–284, Aug. 1999, doi: 10.1080/00909889909365539.
[38] J. W. Creswell, *Qualitative inquiry and research design*. United States: SAGE Publications, 1998.
[39] A. Karabulut-Ilgu, N. Jaramillo Cherrez, and C. T. Jahren, "A systematic review of research on the flipped learning method in engineering education," *British Journal of Educational Technology*, vol. 49, no. 3, pp. 398–411, May 2018, doi: 10.1111/bjet.12548.
[40] J. Hwee and L. Koh, "Four pedagogical dimensions for understanding flipped classroom practices in higher education: A systematic review," *Educational Sciences: Theory & Practice*, vol. 19, no. 4, pp. 14–33, Oct. 2019, doi: 10.12738/estp.2019.4.002.
[41] C. Demirci, "The effect of active learning approach on attitudes of 7th grade students," *International Journal of Instruction*, vol. 10, no. 4, pp. 129–144, Oct. 2017, doi: 10.12973/iji.2017.1048a.
[42] K. A. Nguyen *et al.*, "Instructor strategies to aid implementation of active learning: a systematic literature review," *International Journal of STEM Education*, vol. 8, no. 1, Dec. 2021, doi: 10.1186/s40594-021-00270-7.
[43] M. T. Villalba, G. Castilla, and S. Redondo, "Factors with influence on the adoption of the flipped classroom model in technical and vocational education," *Journal of Information Technology Education: Research*, vol. 17, p. 441, 2018, doi: 10.28945/4121.
[44] M. A. Yeop, M. F. M. Yaakob, K. T. Wong, Y. Don, and F. M. Zain, "Implementation of ICT policy (blended learning approach): Investigating factors of behavioural intention and use behaviour," *International Journal of Instruction*, vol. 12, no. 1, pp. 767–782, Jan. 2019, doi: 10.29333/iji.2019.12149a.
[45] E. L. Deci and R. M. Ryan, *Intrinsic motivation and self-determination in human behaviour*. Springer Science & Business Media, 1985.
[46] H. Ö. Beydoğan, "Middle school mathematics teachers' opinions on feedback," *International Journal of Assessment Tools in Education*, pp. 33–49, Sep. 2017, doi: 10.21449/ijate.339410.
[47] R. M. Neves, R. M. Lima, and D. Mesquita, "Teacher competences for active learning in engineering education," *Sustainability*, vol. 13, no. 16, Aug. 2021, doi: 10.3390/su13169231.
[48] S. Sneck, H. Syväoja, S. Järvelä, and T. Tammelin, "More active lessons: teachers' perceptions of student engagement during physically active maths lessons in Finland," *Education Inquiry*, vol. 14, no. 4, pp. 458–479, Oct. 2023, doi: 10.1080/20004508.2022.2058166.
[49] C. E. Blaszko, A. L. de A. Claro, and N. T. Ujiie, "The contribution of active methodologies to the pedagogical practice of university professors," *Education and Formation*, vol. 6, no. 2, Feb. 2021, doi: 10.25053/redufor.v6i2.3908.
[50] M. Bascopé and K. Reiss, "Place-Based STEM Education for Sustainability: A Path towards Socioecological Resilience," *Sustainability*, vol. 13, no. 15, Jul. 2021, doi: 10.3390/su13158414.
[51] E. Ampadu and A. Danso, "Constructivism in Mathematics classrooms: Listening to Ghanaian teachers' and students' views," *Africa Education Review*, vol. 15, no. 3, pp. 49–71, Jul. 2018, doi: 10.1080/18146627.2017.1340808.
[52] Y. Jackson and R. Feuerstein, *The pedagogy of confidence: Inspiring high intellectual performance in urban schools*. Teachers College Press, 2011.
[53] M. Coman and B.-V. Cioruța, "From human-environment interaction to environmental informatics (III): The social-ecological systems dynamics in knowledge-based society," *Hydraulics, Pneumatics, Tribology, Ecology, Sensorics, Mechatronics*, vol. 1, pp. 124–134, 2019.
[54] D. Duran, M. Flores, and E. Miquel, "The teacher's role during cooperative learning: Should I leave the classroom when students are independently working in teams?" *The Journal of Classroom Interaction*, vol. 54, no. 2, pp. 24–40, 2019.
[55] A. M. Øien and I. J. Solheim, "Physical activity and interaction for less active pupils at elementary school: The experiences of teachers and parents," *European Physical Education Review*, vol. 25, no. 4, pp. 1161–1175, Nov. 2019, doi: 10.1177/1356336X18808544.
[56] M. Rönnlund, P. Bergström, and Å. Tieva, "Teaching in a non-traditional classroom: experiences from a teacher-initiated design project," *Teachers and Teaching*, vol. 27, no. 7, pp. 587–601, Oct. 2021, doi: 10.1080/13540602.2021.1977274.
[57] C. Holmberg *et al.*, "Empowering aspects for healthy food and physical activity habits: adolescents' experiences of a school-based intervention in a disadvantaged urban community," *International Journal of Qualitative Studies on Health and Well-being*, vol. 13, Jun. 2018, doi: 10.1080/17482631.2018.1487759.
[58] D. H. Pho, H. T. Nguyen, H. M. Nguyen, and T. T. N. Nguyen, "The use of learning station method according to competency development for elementary students in Vietnam," *Cogent Education*, vol. 8, no. 1, 2021, doi: 10.1080/2331186X.2020.1870799.
[59] E. W. Corrado, "Using ethnocentric dialogic education to develop the autonomy of children in Africa: A Kenyan study," *Journal for Critical Education Policy Studies*, vol. 17, no. 3, pp. 82–131, 2019.
[60] S. Obara and N. Bikai, "Promoting math teacher active learning with the lesson study approach," *International Journal for Lesson and Learning Studies*, vol. 8, no. 2, pp. 135–148, Apr. 2019, doi: 10.1108/IJLLS-11-2018-0088.
[61] F. Tezcan, "Andragogy or pedagogy: Views of young adults on the learning environment," *International Education Studies*, vol. 15, no. 1, pp. 136–147, Jan. 2022, doi: 10.5539/ies.v15n1p136.

[62] A. Misseyanni, C. Marouli, and P. Papadopoulou, "How teaching affects student attitudes towards the environment and sustainability in higher education: An instructors' perspective," *European Journal of Sustainable Development*, vol. 9, no. 2, pp. 172–182, Jun. 2020, doi: 10.14207/ejsd.2020.v9n2p172.
[63] P. Rasi, H. Vuojärvi, and H. Ruokamo, "Media literacy for all ages," *Journal of Media Literacy Education*, vol. 11, no. 2, pp. 1–19, Sep. 2019, doi: 10.23860/JMLE-2019-11-2-1.
[64] O. Zawacki-Richter and C. Latchem, "Exploring four decades of research in computers &education," *Computers & Education*, vol. 122, pp. 136–152, Jul. 2018, doi: 10.1016/j.compedu.2018.04.001.
[65] S. Sharan and Y. Sharan, *Small group teaching*. Englewood Cliffs, NJ: Educational Technology Publications, 1976.
[66] J. Darling, "A. S. neill on democratic authority: A lesson from Summerhill?" *Oxford Review of Education*, vol. 18, no. 1, pp. 45–57, Jan. 1992, doi: 10.1080/0305498920180104.
[67] H. Lucas, "Neill and Summerhill," *The Magazine of Alternative Education: Education Revolution*, vol. 40, pp. 21–27, 2005.
[68] E. Labinowicz, *The piaget primer: Thinking, learning, teaching*. Boston, United States: Addison Wesley, 1980.
[69] K. A. Clevenger and K. A. Pfeiffer, "Teacher-report of where preschool-aged children play and are physically active in indoor and outdoor learning centers," *Journal of Early Childhood Research*, vol. 20, no. 1, pp. 3–12, 2022, doi: 10.1177/1476718X211033641.
[70] O. Bälter, B. Hedin, H. Tobiasson, and S. Toivanen, "Walking outdoors during seminars improved perceived seminar quality and sense of well-being among participants," *International Journal of Environmental Research and Public Health*, vol. 15, no. 2, Feb. 2018, doi: 10.3390/ijerph15020303.
[71] M. K. Gahl, A. Gale, A. Kaestner, A. Yoshina, E. Paglione, and G. Bergman, "Perspectives on facilitating dynamic ecology courses online using active learning," *Ecology and Evolution*, vol. 11, no. 8, pp. 3473–3480, Apr. 2021, doi: 10.1002/ece3.6953.
[72] G. M. Awada and K. H. Faour, "Effect of Glogster and cooperative learning differentiated instruction on teachers' perceptions," *Teaching English with Technology*, vol. 18, no. 2, pp. 93–114, 2018.
[73] U. Orth and R. W. Robins, "The development of self-esteem," *Current Directions in Psychological Science*, vol. 23, no. 5, pp. 381–387, Oct. 2014, doi: 10.1177/0963721414547414.
[74] C. A. Tomlinson, "Sharing responsibility for differentiating instruction," *Roeper Review*, vol. 26, no. 4, pp. 188–189, 2004.
[75] L. Zucker and A. A. Fisch, "Play and learning with Kahoot!: Enhancing collaboration and engagement in grades 9-16 through digital games," *Journal of Language and Literacy Education*, vol. 15, no. 1, 2019.
[76] J. Maya and J. Maraver, "Teaching-learning processes: Application of educational psychodrama in the university setting," *International Journal of Environmental Research and Public Health*, vol. 17, no. 11, Jun. 2020, doi: 10.3390/ijerph17113922.
[77] R. W. Mee Mee *et al*., "Role of gamification in classroom teaching: Pre-service teachers' view," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 9, no. 3, pp. 684–690, Sep. 2020, doi: 10.11591/ijere.v9i3.20622.
[78] R. W. M. Mee *et al*., "Gamifying education for classroom engagement in primary schools," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 11, no. 3, pp. 1360–1367, Sep. 2022, doi: 10.11591/ijere.v11i3.21918.
[79] S. Mystakidis and A. Christopoulos, "Teacher perceptions on virtual reality escape rooms for STEM education," *Information*, vol. 13, no. 3, pp. 136–148, Mar. 2022, doi: 10.3390/info13030136.
[80] A. Veldkamp, J. Rebecca Niese, M. Heuvelmans, M. P. J. Knippels, and W. R. van Joolingen, "You escaped! How did you learn during gameplay?" *British Journal of Educational Technology*, vol. 53, no. 5, pp. 1430–1458, Sep. 2022, doi: 10.1111/bjet.13194.
[81] C. Grévisse, S. Rothkugel, and R. A. P. Reuter, "Scaffolding support through integration of learning material," *Smart Learning Environments*, vol. 6, no. 1, p., Dec. 2019, doi: 10.1186/s40561-019-0107-0.
[82] R. Garris, R. Ahlers, and J. E. Driskell, "Games, motivation, and learning: A research and practice model," *Simulation & Gaming*, vol. 33, no. 4, pp. 441–467, Dec. 2002, doi: 10.1177/1046878102238607.
[83] D. Jaccard, K. E. Bonnier, and M. Hellström, "How might serious games trigger a transformation in project management education? Lessons learned from 10 Years of experimentations," *Project Leadership and Society*, vol. 3, Dec. 2022, doi: 10.1016/j.plas.2022.100047.
[84] J. Rousseau, *Emile or on education*. La Vergne, United States: Ingram Publisher Services, 1979.
[85] W. A. Dar, "Pedagogy for its own sake: teacher's beliefs about activity-based learning in rural government schools of Kashmir," *Quality Assurance in Education*, vol. 29, no. 2/3, pp. 311–327, Sep. 2021, doi: 10.1108/QAE-01-2021-0013.
[86] H. Ö. Demircan, "'How am I supposed to do this on my own?': A case study on perspectives of preschool teachers regarding integrative STEM practices," *Journal of Early Childhood Research*, vol. 20, no. 1, pp. 93–112, Mar. 2022, doi: 10.1177/1476718X211052749.
[87] J. Piaget, *Play, dreams and imitation in childhood*. Routledge, 2013. doi: 10.4324/9781315009698.
[88] O. Haatainen and M. Aksela, "Project-based learning in integrated science education: Active teachers' perceptions and practices," *LUMAT: International Journal on Math, Science and Technology Education*, vol. 9, no. 1, pp. 149–173, Mar. 2021, doi: 10.31129/LUMAT.9.1.1392.
[89] A. Koutsianou and A. Emvalotis, "Unravelling the interplay of primary school teachers' topic-specific epistemic beliefs and their conceptions of inquiry-based learning in history and science," *Frontline Learning Research*, vol. 9, no. 4, pp. 35–75, Oct. 2021, doi: 10.14786/flr.v9i4.777.
[90] J. W. Phillips and A. Whitworth, "Integrating information practices into everyday teaching," *Journal of Information Literacy*, vol. 16, no. 1, May 2022, doi: 10.11645/16.1.2923.
[91] L. Elder and R. Paul, "Critical thinking: A stage theory of critical thinking: Part 1," *Journal of Developmental Education*, vol. 20, no. 1, pp. 34–35, 1996.
[92] L. Elder and R. Paul, "Critical thinking: A stage theory of critical thinking: Part 2," *Journal of Developmental Education*, vol. 20, no. 2, pp. 34–35, 1996.
[93] J. C. Roberts, "Active learning activities in a collaborative teacher setting in colours, design and visualisation," *Computers*, vol. 11, no. 5, Apr. 2022, doi: 10.3390/computers11050068.
[94] I. Sasson, I. Yehuda, S. Miedijensky, and N. Malkinson, "Designing new learning environments: An innovative pedagogical perspective," *The Curriculum Journal*, vol. 33, no. 1, pp. 61–81, Mar. 2022, doi: 10.1002/curj.125.
[95] C. Vallis and P. Redmond, "Introducing design thinking online to large business education courses for twenty-first century learning," *Journal of University Teaching and Learning Practice*, vol. 18, no. 6, pp. 213–234, Oct. 2021, doi: 10.53761/1.18.6.14.
[96] J. Lee, S. A. Thomas, D. W. Cates, and C. M. McGraw-Senat, "Improved learning experience with modified case studies courses in a pharmacy curriculum," *Currents in Pharmacy Teaching and Learning*, vol. 12, no. 10, pp. 1224–1238, Oct. 2020, doi: 10.1016/j.cptl.2020.05.005.
[97] T. Seow, J. Chang, and K. Neil Irvine, "Field-based inquiry as a signature pedagogy for Geography in Singapore," *Journal of Geography*, vol. 118, no. 6, pp. 227–237, Nov. 2019, doi: 10.1080/00221341.2018.1561740.

BIOGRAPHIES OF AUTHORS

Min Hui Leow is a senior lecturer in Universiti Teknologi MARA (UiTM), Cawangan Pulau Pinang, Malaysia. She pursued her PhD in Curriculum and Instructional Technology at the University of Malaya, Kuala Lumpur. She is proficient in developing teaching and learning that meets learners' learning needs and actively adapting student-centered experiential learning. Her research interests lie in the systematic design of instruction, fundamentals of teaching and learning development, and contemporary patterns in teaching and learning. She can be contacted at email: leowminhui@uitm.edu.my.

Norshahida Hassan is an English language lecturer in Kolej Matrikulasi Pulau Pinang and is currently pursuing her PhD in Educational Technology at the University of Malaya. She also has an experience in teaching English language to pre-university students for the past 25 years. Her research areas consist of interests in teaching and learning development as well as the implication of teaching methods using technology in classrooms. She can be contacted at email: shahidasharizal@gmail.com.

Sabrina Adia Mohd Sharizal is an English Language Studies graduate from Universiti Kebangsaan Malaysia and has an experience in academic journalism as well as copywriting for websites. She has a plethora of interests in the academic settings including genders in English language and using gamification as a means of teaching and learning development. She can be contacted at email: sabrina.adia@gmail.com.

Rafiza Abdul Razak is an associate professor at the Department of Curriculum and Instructional Technology, Faculty of Education, University of Malaya, Kuala Lumpur. She is an innovative leader who creatively rebrands the department to uplift and boost the departments' wellbeing. She actively organizes international and national seminars. She also initiated several MoAs at the national and international levels. Her innovations awarded in patents, copyrights, and trademarks accumulated to more than 81 registered products. She can be contacted at email: rafiza@um.edu.my.