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Elements of Effective Teaching in Higher Education: Implication to Anatomy Education

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ABSTRACT

Teaching anatomy is a challenging task to anatomists as they need to stimulate students' three-dimensional visualisation ability. Despite the needs for lecturers to be competent in instructional design and delivery, many anatomists are unsure about elements of effective teaching as the fundamental work on this area is scarce. Since anatomy is mainly taught in the higher education institutions, it is pertinent to find a comprehensive definition and framework of effective teaching in universities that could be adapted into anatomy teaching. Hence, we performed a scoping review to unearth the features of effective teaching in higher education using the five-stage framework of Arksey and O'Malley, namely identification of research question, identification of relevant study, selection of suitable study, data charting, and result collating and reporting. Three databases (Google Scholar, Scopus and PubMed) were searched using two search terms with a Boolean combination: "effective teaching" and "higher education." The initial pool of 1,708 topics was assessed for duplication, and study eligibility was evaluated using inclusion and exclusion criteria. Data were abstracted from 14 original articles by two independent researchers and a thematic analysis was performed. Findings revealed the following categories of effective teaching elements, which have been proven effective in the achievement of learning outcomes: (a) pragmatic teaching, (b) learning support, and (c) optimised classroom management. Each theme overlies several sub-themes that reflect substantial numbers of effective teaching elements. The review provides evidence that a teacher's role is not limited to teaching but includes the provision of support to students and management of the classroom environment to optimise learning. This article previews the utilisation of these teaching elements in anatomy education and its implication to future medical education.

Keywords: *Effective teaching, Anatomy education, Pragmatic teaching, Learning support, Classroom management*

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INTRODUCTION

Anatomy is an important medical subject that requires ability of anatomists to stimulate students' three-dimensional visuospatial ability and mental imagery when learning anatomical structures (1). In view of its complex nature, anatomy subject is often taught through multimodal approaches and tools (2). Hence, anatomy educators need to be vigilant and creative in creating effective teaching session that could facilitate the development of desired learning outcomes (3). Despite playing fundamental roles in anatomy teaching, many anatomists were unsure about their teaching ability and unaware about effective pedagogical elements (4). Ironically, not many of them had formal training in teaching and learning before becoming anatomy teachers. Most of them are qualified as anatomists after completing postgraduate programmes in anatomy or related fields, which are mostly lacking in pedagogical input (5–6). Since anatomy is mainly taught in the higher education institutions, it is pertinent to find a comprehensive definition and framework of effective teaching in universities that could be adapted into anatomy teaching.

Teaching is a scholarly activity that requires contextual expertise in a subject area (7). For the past several decades, teaching in higher education institutions has undergone a significant evolution in term of methodologies and tools used for teaching (8). With the advancement of information technology, university teaching is no longer limited to the lecture-hall setting. Instead, distance learning is made available with the use of electronic learning (e-learning) and mobile learning (m-learning) (9–10). The adoption of these teaching methods created a borderless educational environment, which enabled students to learn at their pace. Nevertheless, an accepted comprehensive definition of effective university teaching is lacking (7). With the increasing demand for high-quality university teaching, debate within the higher education community continues on what factors contribute to teaching effectiveness (7).

Effective teaching in higher education is a contested concept with different definitions (11). The term has been defined in various ways according to teacher attitude, ideology and expertise on the subject matter; ability to enhance students' learning performance; and effort to prepare students in using high-level cognitive processing during learning (12–13). Various attempts were made to describe the characteristic of effective teaching using different theoretical perspectives and disciplinary stand points through quantitative and qualitative approaches (14–16). Kreber (17) highlighted that a good teacher will know how to motivate students, deliver concepts and information efficiently and assist students to handle obstacles related to learning. Hence, a teacher's role to effective teaching and influencing students' achievement is undeniably important. The conventional teacher-centric view of teaching assumes the teacher as the source of knowledge who didactically delivers information. Many students do not favour traditional teaching because it does not emphasise on active participation in class and limits autonomy in learning (18). Hence, the traditional teaching method has been replaced by the student-

centric methods that place the teacher as a facilitator and students as owners of learning (19). Nevertheless, there is scarce published data on the elements of effective teaching in anatomy education, as majority of anatomy education research were confined to exploring the effectiveness of teaching methods or innovations, related to the use of instructional design theories, virtual applications and arts elements (20–23). In view of these, the present study was designed to systematically discover these elements in higher education through the scoping review method. The study aimed to answer a fundamental research question: "What are the functional elements for effective teaching in higher education?"

METHODOLOGY

The scoping review was performed using the five-stage framework by Arksey and O'Malley (24); this framework was used to extensively examine the literature on the effective teaching in higher education.

Stage 1: Identifying the Research Question

The focus of the scoping review was to determine the features of effective teaching. Hence, it intends to answer one research question: "What are the functional elements available for effective teaching in higher education?"

Stage 2: Identifying the Relevant Studies

Three major online databases, namely, Google Scholar, Scopus and PubMed, were used for the literature search. The search was restricted to full articles in the English language dated from January 2010 to December 2019, which described at least one element of teaching in higher education and have been proven to result in positive learning outcomes. The 10 years range of literature search was choosed as the articles within this period were still considered up to date and credible (25). The unpublished article was excluded in the literature search due to its having a lower methodological quality, uncertainty of the status of its information and the absence of peer-review (26). Two keywords with a Boolean combination were used as search terms: "effective teaching" and "higher education". The search strategy was finalised and the search term included: (effective teaching OR teaching effectiveness) AND (high education OR high educational), that were generated from the "MeSH terms". Prior to the review, several eligibility criteria were developed for the selection of relevant studies. These criteria were used to screen the title, abstract and content of the article accordingly before the final selection of the full article. The eligibility criteria for title, abstract and full article selection are summarised in Table 1.

Table 1: Criteria for study selection

Eligibility criteria	Criteria
Eligibility criteria for title selection	Title in English. Year of publication is from 2010 to 2019. Title reflects on element of good teaching.
Eligibility criteria for abstract selection	Abstract reflects the article is an original article. Abstract highlights at least one element for good teaching in higher education. Abstract provides evidence of a robust study design that is not limited to randomised controlled trials. Abstract shows evidence of evaluation on the good teaching strategies in higher education. Abstract highlights at least one quantitative or qualitative measurable outcome(s).

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Table 1: *(continued)*

Eligibility criteria	Criteria
Eligibility criteria for the full text of articles selection	Article elaborates the functional elements that has been proven to promote good teaching. Article provides clear methodology on the measurement of the outcome(s) Article has a well-designed research intervention. Article shows evidence of evaluation on the good teaching strategies in higher education. Article reports at least one quantitative or qualitative measurable outcome(s).

Stage 3: Selecting Relevant Studies

Several steps were undertaken to select the relevant studies for the review. First, the titles of the resources generated from each database were screened for suitability with the research question and for duplication. Abstracts of the shortlisted titles were retrieved and screened for eligibility based on the inclusion and exclusion criteria. Afterward, the full articles of the shortlisted abstracts were reviewed accordingly. The full articles that met the eligibility criteria were considered for data charting. The referred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flowchart was used to report the study selection process (27).

Stage 4: Charting the Data

The selected full-text articles that meet the inclusion criteria were thoroughly reviewed. Several data were extracted from these articles, such as authors, year of publication, learning strategy tested, study design, study subjects and study outcome. Data were charted in a Microsoft Excel spreadsheet.

Stage 5: Collating, Summarising and Reporting Results

The key information of the retrieved data was summarised and presented in table form. Thematic analysis was independently conducted by the first author (SBT) and last author (SNH), to categorise the key information into several effective teaching elements. A two-level coding was performed, whereby the key information was categorised into several groups based on the similarity of the elements. The codes were then categorised into several sub-themes, which eventually grouped into several main themes. Following that, the main themes and subthemes were used to form a functional framework of effective teaching elements. This framework was discussed among the co-researchers in an online synchronous meeting to validate its consistency and accuracy, whereby any discrepancies were discussed and resolved. All members of the research team agreed upon the final list of the themes and sub-themes. For the ease of data presentation, the results of included studies were grouped according to the main themes.

RESULTS

From the keyword search, 1,708 topics of resources were identified as potentially relevant to the research question. Screening of the topics of these resources yielded 425 abstracts, out of which review articles, editorials and theses were eliminated. After analysing the eligibility of the abstracts, 271 abstracts were eliminated. The full articles of the remaining 181 abstracts were retrieved and critically screened using the eligibility criteria for full articles. The thorough process of screening yielded 14 final full articles, which underwent another process of data charting and collation. Figure 1 illustrates the output from the scoping review process and Table 2 summarises information extracted from the 14 articles.

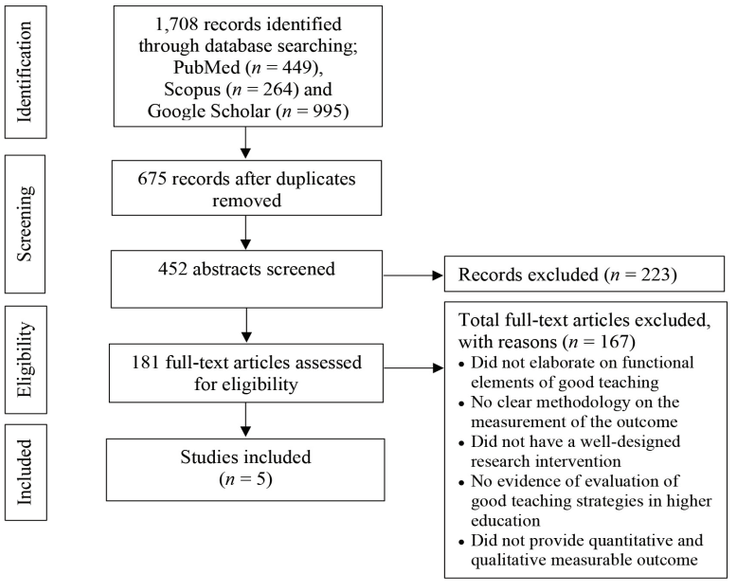

Figure 1: Output from the scoping review process.

Table 2: Information extracted from the 14 articles

Author(s)	Learning strategy performed	Study design/subjects	Outcomes
Bédard et al. (28)	Problem- and project-based learning in engineering and medicine	Cross sectional/480 undergraduate students	High correlation between perceived stress in learning environment with student engagement and persistence
Brock et al. (29)	TeamSTEPPS communication training model	Cross sectional/306 medical, nursing, pharmacy and physician assistant students	Simulation-based inter professional TeamSTEPPS training has positive impacts on student attitudes, knowledge and skills
Burguillo (30)	CnBL	Cohort/505 undergraduate telecommunication engineering students	CnBL increased students' motivation and performance
Fowler & Boylen (31)	PWAY programme	Cohort/453 non-PWAY and 434 PWAY college students	Increase in student success and retention when the educators addressed non-academic factors related to student success
Henderson et al. (32)	RBIS in physics	Cross sectional/722 physics faculty members	RBIS are effective in motivating faculty members to learn innovative instructional strategies
Perron et al. (33)	Faculty development programme comprising small group modules and individual coaching sessions	Pre-post quasi experimental with control/48 clinical supervisors	The faculty development programme was effective in increasing the number of communication issues discussed interactively in feedback sessions

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Table 2: *(continued)*

Author(s)	Learning strategy performed	Study design/subjects	Outcomes
Mauri et al. (34)	Feedback system to improve collaborative text writing	Cohort/218 students and 4 teachers	Integration of essential characteristics of effective feedback and information communication technology is relevant for supporting learning in complex tasks
McCaughey & Traynor (35)	Simulated learning	Cohort/153 undergraduate nursing students	Simulation using high-fidelity simulators is perceived as a valuable method of learning
Nadolny & Halabi (36)	Game-based learning in curriculum design	Case control study/71 undergraduate students	Students maintained high participation and met course requirements in game-based learning
Rizakhojayeva et al. (37)	Integration of information and communication technologies in educational process	Experimental/66 third-year management and tourism degree students	The integrated teaching system led to significant improvement and higher achievement in learning
Tan et al. (38)	Kahoot!, a gamified learning platform	Mixed quantitative and qualitative, cohort/51 participants from Universiti Sains Malaysia	Kahoot! is helpful for inducing motivation and engagement and in reinforcing learning
Tsay-Vogel & Brady (39)	Cooperative learning in communication pedagogy	Case study/24 undergraduate students	Cooperative learning had positive impact on student's academic performance
White et al. (40)	A protein investigator simulation software	Cohort/161 undergraduate students	Simulation is an effective method to learn about basic principles of knowledge
White et al. (41)	Transformation of traditional teaching methods to active learning strategies in research-intensive institutions	Cohort/45 academic staffs and over 1,000 students	Positive changes in the participant attitude, behaviour and practice related to the use of active learning strategies

Notes: TeamSTEPPS = Team Strategies and Tools to Enhance Performance and Patient Safety; CnBL= Competition-based Learning; PWAY = Pathways to Success; RBIS = Research-based Instructional Strategies

Thematic analysis yielded three main themes of effective teaching, namely, pragmatic teaching, learning support and optimised classroom management. Each theme overlies several sub-themes that reflect substantial numbers of effective teaching elements. Table 3 summarised the findings of thematic analysis.

Table 3: Themes, sub-themes and teaching elements

Main theme	Sub-theme	Teaching elements
Pragmatic teaching	Possess good digital skill	Use information technology in teaching (37)
		Use simulation in teaching (41)
	Provide clues, hints and analyses of the learned information	Make the students aware of the clue or hint (29)
		Analyse and provide full description of the information (34)
	Emphasis on contextualised learning	Use real world problems (28)
		Use a contextual lens to interpret learning or information (28)
		Adopt teaching methods according to context (41)
	Design instructions that promote mental imagery	Provide three-dimensional presentation (41)
	Emphasise on generating important facts from activity	Help students identify the gist of the lesson (38)
	Create a flexible learning goal	Create a goal that focuses on achieving success (31)
		Match the goal with students' desire (38)
		Adapt team goal to any changes that might occur (40)
		Make goal comprehensible to students (32)
		Negotiate with students to achieve common goal (33)
Learning support	Facilitate students giving their opinions and promote student discussion	Provide platform for students to give their opinion in any learning situation (28)
		Allow students to share their knowledge and ideas (28)
		Provide a platform for student to have discussions among themselves (36)
	Emphasise on self-reflection after learning	Provide platform and opportunity for students' reflections on their learning (28)
	Optimise students' individual talents	Identify leaders among students (29)
		Identify and nurture individual skills and talents (41)
	Provide students with learning autonomy	Give students opportunities to respond to questions posed by other team members (29)
	Promote students' engagement	Emphasise students' presence and involvement in activity (36)
		Encourage students to indulge in activities that promote competition through games (38)
	Stimulate students' motivation and interest	Impose positive learning stressors (28)
		Create interest through activity-based learning (38)
		Instill positive insights into students to achieve the best outcomes of learning (38)
		Promote positivity to strengthen their insight (38)
		Implement teaching through a competitive approach and encourage a collaborative learning environment (38)
		Encourage students' active participation (30)
	Deal with students' weaknesses	Detect signs of students' weaknesses (41)
		Suggest means for students to address their weaknesses (35)
	Provide guidance for problem-solving	Guide students to identify the key issues of problem-related learning (28)
		Provide learning support to reduce stress induced by learning (28)

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Table 3: *(continued)*

Main theme	Sub-theme	Teaching elements
Optimised classroom management	Formulate a well-planned teaching schedule	Monitor the duration for the achievement of learning outcomes (38)
	Establish an appropriate class size	Set a suitable number of students per class to enable the smooth implementation of learning activities (32)
	Emphasise building a dynamic group	Establish a team of students with different talents to complete tasks (29)
		Foster professional bonding among students (30)
		Help students choose a team goal (39)
		Ensure all members work in teams and contributes to learning (39)
		Ensure effective two-way communication among students using clear language (33)

DISCUSSION

This scoping review identified three functional elements of effective teaching in higher education, namely, pragmatic teaching, learning support and optimised classroom management, which outlined 39 effective teaching strategies from 14 studies. The review provides evidence that a teacher's role is not limited to teaching but includes the provision of support to students and management of the classroom environment to optimise learning.

The first criterion of effective teaching is pragmatic teaching, which determines a teacher's ability to adapt to various teaching challenges (42). One of the elements of pragmatic teaching elicited from the review is the possession of good digital skills, which supports the fact that technology-enhanced teaching is an essential element of anatomy education in the 21st century (43). Moreover, the unprecedented COVID-19 pandemic has had an enormous impact on the medical and anatomy education curriculum, whereby e-learning (i.e., computer or internet network-based instruction) and m-learning (i.e., mobile technology-based instruction) have rapidly become a delivery method in many countries (44–49). Due to limitations of cadaveric dissection in the modern anatomy curriculum, the teaching trend is moving towards the use of technology-enhanced learning that can improve students' 3-D visualisation of anatomical structures (i.e., Complete Anatomy application) and provide opportunity for remote learning through computer network and learning management systems (50–51). Indeed, technology enhanced learning has been proven to be a great compliment to traditional cadaveric dissection in promoting anatomy learning (52–53). Nevertheless, focusing on the teaching and learning processes is crucial rather than heavily emphasising the integration of technology into teaching because it can be a source of extraneous cognitive load to students (54).

Moreover, a pragmatic teacher should provide teaching cues, such as clues, hints and description of the learned information, such that the students become aware of important information that requires extra attention (29). Visual cues are effective in guiding learning on the individual contents of a subject and on the application of higher order thinking tasks, such as searching for new knowledge (55). Visual cues can also increase student reaction time, improve student understanding on key information and strengthen the ability to recall knowledge (1, 56). In anatomy teaching, the use of visual cues is important when teaching novice students, especially when cadaveric-based and technology-

enhanced learning are not available in the educational setting. Visual cues would direct students' attention to the learned anatomical structures, and allows the visuospatial sketchpad centre of the working memory to process the information (1, 57).

Likewise, promoting mental imagery is one of the identified teaching elements of a pragmatic teacher. Pearson et al. (58) defined mental imagery as representations and accompanying experiences of sensory information without a direct stimulus. Cui et al. (59) confirmed the effectiveness of using 3-D models to teach anatomy in a medical education research on complex anatomical structures. Likewise, Chen et al. (60) suggested that a 3-D printed Henle trunk model is an effective teaching tool that helped interns to understand the anatomy of the Henle trunk. Many studies have shown that focusing attention to one specific stimulus or part of a structure can alter the multiple dimensions of the sensory perception. Therefore, imagery can be disconnected from visual attention if it is in 3-D form (61). Notably, it also improved students' understanding of the learned instruction (62).

Another important criterion of a pragmatic teacher is placing emphasis on contextual learning, where teachers should prepare learning materials that enable students to construct the meaning of learned information through their experience. In anatomy education, contextualised learning is achieved through vertical integration of instruction. For instance, gross anatomy is taught together with radiological anatomy that exposed students to various radiographic images (63); students are exposed to clinical vignette or triggers through problem-based learning (64); students are engaged with inquiry-based learning during anatomy classes (65); and clinical skills practice is performed on soft embalmed cadavers to enhance realistic human tissue appearance and texture (66). Teaching using the contextualised learning concept will help lecturers to emphasise the importance of knowledge transfer into practice in daily activity and, thus, enable increased independence among students.

Furthermore, promoting experiential learning is an important element of a pragmatic teacher. Experiential learning is a learning condition from which students learn from first-hand experience (67). Spencer (68) proposed that learners are passing through a loop of four phases, namely, thinking, applying, experiencing and reflecting. These phases permit students to incorporate new knowledge with prior knowledge and enable them to transfer new information to long-term memory (31). Likewise, experiential learning is defined as the acquisition of knowledge by the transformation of new experiences (69). Hence, experiential learning is not limited to "learning by doing", but also emphasises "learning through reflection by doing" (70). The use of experiential learning in anatomy education is well known. For instance, Diaz and Woolley (71) created experiential learning in anatomy through various teaching approaches namely, white-boarding and drawing, body painting, modelling of anatomy structures using playdough, and singing and dancing activities. Sa'hari et al. (72) introduced the role of radiological-anatomy supplementary e-learning through utilisation of Massive Open Online Course (MOOC) in creating experiential learning. Abdul Manan et al. (73) created an experiential learning through anatomy model casting using the Plaster of Paris (PoP).

Moreover, effective teaching includes providing students with learning support, which can be in the form of guidance and promoting engagement. One element of learning support elicited from this review is to facilitate students to give opinions and promote student discussions (28). This finding supports the fact that discussions serve as a platform for the students to gain experiences and process information during learning (74). Discussion has been proven to improve student's communication skills, enhance the learning process and promote critical thinking (75). Green et al.

(76) reported that students participation in asynchronous online discussion forum improved students learning performance in gross anatomy. Indeed, peer discussion has been successfully induced through team-based learning approach in gross anatomy practical classes (77–79), and through the use of social media platform for discussing difficult topic in anatomy (80).

Furthermore, emphasising self-reflection after learning was found as another important element of learning support in anatomy education. Hadie et al. (1) found a positive relationship between self-reflection and academic achievement, level of motivation and self-confidence of students after attending a cognitive load theory-based anatomy lecture. Camp et al. (81) who described self-reflection as one of the attributes to professionalism in anatomy, reported high ability of students to self-reflect on their learning following personalised feedback. In doing so, the lecturer is providing students with opportunities to reflect on what they have learned and how much they could appreciate such knowledge (82). Consequently, the students would feel motivated to plan ahead their learning activities. Indeed, providing autonomy to students to plan, perform and control their own learning is an important form of learning support that was identified in this review (28). This finding corresponds with the Ryan and Deci (83), who found that the autonomy-supportive classroom teaching method was related to students' preference for more challenging tasks, deeper understanding, feeling of enjoyment and perception of competence.

Consequently, this review elicited the needs of teachers to optimise students' individual talents by nurturing students' skills and identifying the potential good students to be leaders. For instance, Hughes (84) emphasised several selection criteria for peer-leader selection in peer assisted learning strategies in human anatomy courses. Having a good student leader in peer assisted learning would boost students' engagement and promote interactive environment without the presence of lecturers. A productive student leader focuses on improving the learning needs and strengthens what has been done correctly. Additionally, learning support includes the promotion of students' cognitive, physical and affective engagement (36). This finding supports the facts that lecturers need to direct students' attention to an instructional material, thus enforcing participation in class and instilling learning values for effective teaching (85). Hadie et al. (57) described an engaging instructional delivery is essentially important to ensure effective cognitive processing of anatomical content. Likewise, Singh et al. (86) reported that teaching anatomy through active and engaging learning strategies that involved various modes of presentation (i.e., poems, story-telling, singing and skits) had improved students comprehension of anatomy topics. Moreover, Green (87) demonstrated a strong relationship between student engagement and quality of teaching, which has become the main factor that leads to student retention, persistence and success.

The final element of learning support is stimulating students' motivation and interest. Cook and Artino (88) defined motivation as one's path that lead to behaviour or construct that stimulates one's desire to replicate such a behaviour. It was proven that students' motivation influenced their cognitive, behavioural and emotional engagement to instructional materials and learning activities (89); hence, lack of motivation can lead to the hindrance of success (90). In anatomy education context, stimulation of students' motivation and interest are achieved through various teaching modalities and learning activities, namely interactive lectures (57), blended learning (91), contextualised integrated clinical teaching (92) and utilisation of real or simulated patients in problem-based learning (93). In cognitive sciences, motivation and interest contributes to the germane load of the students (94). In other

words, with high motivation and interest, students would consciously allocate working memory resources to process the new information that they are learning (95).

The third criterion of effective teaching is the optimisation of classroom management, which could be defined as providing a positive and lively learning environment (96). One of the elements of optimised classroom management is ensuring a good class schedule that can accommodate the students' learning needs (36). A proper academic schedule set by the teacher for formal academic sessions will indirectly train students to manage their time effectively. Nevertheless, in an integrated modern medical curriculum, time allocated for anatomy teaching has been significantly reduced to accommodate new emerging medical subjects (97). Therefore, some teaching modalities, such as cadaveric dissection became less feasible, and thus triggered anatomists to find an alternative way to teach anatomy effectively. The second classroom management element is the establishment of an appropriate class size (32). In fact, class size and the staff to student ratio have been extensively used as an indicator of quality at colleges and universities (98). It was reported that class size in anatomy courses determined the students study strategies and eventually influenced their retention of knowledge (99).

The third classroom management element elicited from the review is setting up learning goals, where the lecturer must set a goal aligned with students' desire such that learning outcomes could be achieved. To render the objectives effective, lecturers should assist students to form a strategy to achieve such goals, albeit challenging (100). Likewise, lecturers should help students to establish a dynamic group when they are assigned with group work or task (29). A dynamic group ensures good interaction among students, which consequently determines the success of task completion (101). Hence, having a dynamic group is an important predictor of successful collaborative learning. Chen et al. (60) also found that students performing tasks in small groups are better able to achieve higher learning outcomes than those who perform tasks individually.

CONCLUSION

This study presents a comprehensive examination of the literatures—limited to original articles—pertaining to effective teaching in higher education. Although the heterogeneity of the articles included in the review is recognised, the current review categorised the elements of effective teaching into three main themes, namely, pragmatic teaching, learning support and optimised classroom management. It was evident that the identified effective teaching elements in higher education are replicable in the context of anatomy education, as these elements could be adapted by anatomy teachers through integrated multimodal approaches, contextualised learning, experiential learning, adoption of effective teaching plan and behaviour, and management of anatomy education environment. Indeed, information gained from this review would be able to instil confidence and positive attitudes among anatomy lecturers in being creative and innovative in their teaching. However, giving the fact that each identified teaching element was tested separately, it would be useful to expand our understanding of how these elements are functional and effective when they are combined as one teaching strategy, especially in anatomy education context. Hence, further studies are needed to investigate the efficacy of this integrated approach in promoting students cognitive, physical and emotional engagement towards the learning process, as well as the attainment of the learning outcomes.

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ETHICAL APPROVAL

This research was approved by Universiti Malaysia Sarawak Ethics Committee [UNIMAS/NC-21.02/03-02 Jld.3 (95)] and Universiti Sains Malaysia Human Research Ethics Committee [USM/JEPeM/19070404].

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