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RESEARCH

Exploring pre-clinical medical students' perception of and participation in active learning: A mixed-methods transnational study

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Abstract

Background: Active learning is a learning process that promotes student engagement in constructing knowledge and conceptual understanding, improves critical thinking skills and develops professional competency. In recent years there has been a significant shift of emphasis in higher education from passive teacher-centred didactic teaching to active student-led learning. Although there is abundant literature about active learning, there is a gap in the knowledge of students' perception regarding factors that affect engagement in active learning activities. This project aimed to explore pre-clinical year medical students' perception of active learning and examine the factors that affect their participation in active learning activities.

Methods: A mixed-method study was conducted with pre-clinical medical students at Newcastle University Medical School, UK, and Newcastle University Medicine Malaysia. A total of 266 students participated in an online survey questionnaire, with 25 students participating in focus group discussions (FGD). Quantitative data were analysed using descriptive analysis and qualitative data was analysed with thematic analysis.

Results: The majority of students (94.7%) recognised that active learning is important for their learning, but had a narrow definition of what active learning constituted, and familiarity with active learning techniques was lacking. Many students' independent learning techniques were centred around methods of 'active recall', with factors

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affecting the utilisation of active learning techniques mainly focused on time availability, group dynamics in active teaching sessions and teaching styles of educators.
Conclusion: Students acknowledged the importance of active learning but are generally unfamiliar with ways to effectively utilise a broad range of active learning strategies. This study demonstrated that it is important for educators to understand firstly how students define active learning as well as how students interact with active learning taught sessions, to ensure that they create an environment where students feel confident to engage in active learning techniques.

1 | INTRODUCTION

Active learning in higher education, underpinned by constructivist theories, promotes knowledge construction through engagement and interaction, and is a recommended teaching method in medical education.[1] However, what constitutes 'active learning' may mean different things to different people,[2] but is often used to cover anything that is not the traditional didactic lecture, and involves some form of student engagement and activity. Much of the focus of active learning has been around instructors; the training of staff to be more active in their approach to teaching, or how to overcome barriers/attitudes to implementing active learning methodology.[3–6] The shift towards active learning strategies over traditional lectures aims to improve student outcomes, including exam performance and deeper learning comprehension,[7–9] though the extent to which active learning techniques improve student learning compared to more passive techniques has been questioned.[10] In medicine, this has influenced curriculum design to incorporate case-based and problem-based learning, moving away from rote memorisation and towards real-world application.[11,12]

More recently focus has shifted to assessing active learning in the context of equality, diversity and inclusion in education. There is a known achievement gap in medicine, particularly amongst ethnic minorities,[13] that does not appear to be closing.[14] Active learning strategies have been shown to narrow the achievement gap amongst underrepresented and economically disadvantaged students in STEM fields.[15,16] However, active learning may not be inclusive for students with disabilities if appropriate accommodations are not implemented.[17] Whether active learning increases or decreases inclusion may depend on the type of active learning utilised, and how the active learning tasks are structured. For example, active learning may have both positive and negative impact for students from the LGBTQIA+ community.[18]Peer- led workshops improved outcomes for all, and closed gender and under-represented minority group attainment gaps,[19] whereas peer discussions (a form of active learning) may lead to differential experiences based on gender, race and nationality.[20]

Cultural differences may also influence student engagement in active learning strategies. Activities requiring verbalisation of thought may be detrimental to East Asian students,[21] and east Asian students are less likely to ask or answer questions in class, or challenge a teacher on taught content.[22] Similarly, students taught in a second language (international students) may be less confident in engaging in active learning teaching methods where group discussion and student interaction are more common.[20]

The high prevalence of mental health diseases amongst medical students is well established[23,24] and has increasingly been considered when evaluating the effectiveness of active learning strategies, particularly in the wake of the COVID-19 pandemic. Students who have been previously diagnosed with depression interact less with the active learning process, but also benefit from the increased social interaction active learning provides.[25] Active learning techniques have both positive and negative impacts on student anxiety, with 'fear of negative evaluation' the main trigger of increased anxiety.[26–29]

Whilst active learning has been championed over passive teaching and learning techniques, the potentially negative experiences of students, whether real or perceived, may influence student engagement in a curriculum with a heavy emphasis on active learning. Most studies have focused on either encouraging faculty staff to introduce more active learning into their teaching,[4,30] or testing the success of active learning in educational gain.[7] A better understanding of student perceptions of active learning and how students engage in active learning inside and outside the classroom is important since active learning sessions have been perceived by students to be less effective than more passive teaching.[31] Similarly, since active learning has many meanings amongst academics,[2] students may define 'active learning' differently to teaching staff. Discovering what students understand 'active learning' to mean may better inform teaching strategies.

To address this gap, this study looked at medical student perceptions of active learning across two campuses in the UK and Malaysia to explore what strategies they use and the reasons why students may or may not engage in active learning techniques. Primary research aims were to assess; 1. what students understood 'active learning' to mean, 2. whether students favoured active or passive learning techniques and 3. reasons why students may or may not engage in active learning in either their independent learning or in structured teaching sessions. Since previously published work has already discussed similarities and differences between the student cohorts participating in this study,[22] a secondary research aim was to assess whether attitudes to active learning across the two campuses were similar or different, given the diverse range of students studying at each campus and their different educational, social and cultural backgrounds.

2 | METHODS

2.1 | Study design

Considering the multidimensional nature of medical students learning, a mixed-method study with an exploratory sequential design was determined to be the ideal methodology to explore the complex phenomena. Since active learning is constructivist in nature the authors approached this study from the constructivist paradigm. In the exploratory sequential approach,[32] the quantitative research phase was completed first through collecting and analysing survey data. Then qualitative methods were used to gain further explanation and interpretation of the quantitative results.

2.2 | Participants

Participants were recruited to the study through convenience sampling through institutional e-mail lists controlled by a gatekeeper (both campuses have a research management group that reviews study design and who are gatekeepers to accessing students as participants in research studies). Within the questionnaire, participants were asked if they would consent to being contacted for focus groups. Participants were year 1 and year 2 students studying medicine at the Newcastle University UK, (NCL) and Newcastle University, Malaysia campuses (NUMed). To encourage participant recruitment an incentive of £5 (UK students) or RM10 (NUMed Students) in food vouchers was provided for the first 50 respondents to the questionnaire at each campus.

2.3 | Data collection

To collect quantitative data, a 66-item questionnaire was created in the JISC online survey platform, consisting of a participant information sheet, consent form, demographic data questions and active learning items based on two validated instrument tools; Assessing Student Perspective of Engagement in Class Tool (ASPECT)[33] and Blended Learning Questionnaire (BLQ).[34] The statement items for the questionnaire are listed in Tables 2 and 3, but no reference to 'active' or 'passive' was included with the questionnaire. The questionnaire was distributed to participants via e-mail link. Anonymised data was downloaded from the survey tool into Microsoft Excel (Microsoft Corp.) and formatted for data analysis in the Statistical Package for Social Sciences (SPSS, IBM Corporation) software. Qualitative data was collected through free text questions in the questionnaire and from focus group discussions and imported into NVivo software (QSR International Pty Ltd). Focus groups were conducted and automatically transcribed through Microsoft Teams (Microsoft Corporation) by JJ and NS as student interns. Using near-peers to conduct this aspect of the data collection reduced the risk of power differentials between participants and interviewers influencing responses.

2.4 | Data analysis

Data from short answer free text questionnaire questions were analysed in NVivo using 'word frequency' and 'word search' options. This method was used to analyse how students define 'active learning' to ascertain and explore common words and phrases.

Thematic analysis of qualitative data from focus groups was completed on the NVivo software using the method described by Maguire and Delahunt[35] based on Braun and Clarke.[36] Initial codes from reading focus group transcripts were created in NVivo as two mind maps (one for UK and one for NUMed) using inductive analysis. Information from the mind maps were converted into written codes in NVivo, and text from the transcripts was then mapped to the codes following further transcript reads. Codes were modified as appropriate during this phase. Codes were then organised into themes and data reviewed again before final themes were defined.

Quantitative data was analysed in SPSS. Though Likert scale data may be considered parametric,[37] using non-parametric tests were preferred since the data was not normally distributed around the mean, and so Mann-Whitney U tests were utilised to compare the central tendency of the Likert scale data. However, for completeness, means of Likert data are provided in tables alongside the percentage frequency distribution of scores and medians.

3 | RESULTS

3.1 | Participants

A total of 266 (30%) participants completed the questionnaire across the two campuses (80/217, 37%, from NUMed, 186/670, 28%, from the UK). The demographic breakdown of participants is shown in Table 1. Five focus groups were conducted with a total of 25 participants (18 NUMed, 7 UK).

3.2 | Quantitative and qualitative data

Though transcripts from focus groups of UK-based students were coded separately from the NUMed students, similar themes arose from both groups so the qualitative data has been combined and will be discussed in context throughout. The three main themes from the focus group transcripts are

1. student understanding of active learning,
2. students' perception of the value of active learning methods in taught sessions and

TABLE 1 Participant demographics.

		NUMed		NCL UK		Combined	
Participant number		80 (37%)		186 (28%)		266 (30%)	
Average age		19.39		19.85		19.71	
Sex	M	31		70		101	
	F	48		115		163	
	PNTS	1		1		2	
Ethnicity	Caucasian	0		117		117	
	Afro-Caribbean	1		3		4	
	Chinese	35		9		44	
	Indian	23		21		44	
	Malay	3		0		3	
	Other	18		36		54	
Education Level	SPM/GCSE	14		3		17	
	STPM/A-Level	62		163		225	
	Diploma	2		3		5	
	Bachelors	2		15		17	
	Masters	0		2		2	
Year group		Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
		37	43	94	92	131	135

Key to acronyms in table:
Newcastle University Medicine Malaysia (NUMed), Newcastle University UK (NCL UK), prefer not to say (PNTS), Sijil Pelajaran Malaysia (SPM), General Certificate of Secondary Education (GCSE), Sijil Tinggi Persekolahan Malaysia (STPM).
Definition of education level:
Sijil Pelajaran Malaysia (SPM) - Malaysian Certificate of Education equivalent to UK GCSE.
Sijil Tinggi Persekolahan Malaysia (STPM) - Malaysian High School Certificate equivalent to UK A-Levels.

3. motivators and demotivators of students' engagement in active learning.

There was considerable overlap of codes across the themes, with some mapping of the content within the themes to the data from the quantitative component of the study. Due to this overlap, both the qualitative and quantitative data will be integrated to enable a coherent narrative of the results to be expressed.

3.3 | Definition of, and interest in, active learning

A word cloud of the most popular words used in to define active learning (combined on both campuses) is shown in Figure 1. An example of key linked phrases is shown in Figure 2 demonstrating that students associate 'active learning' with the much narrower definition of 'active recall'.

When asked if 'Active learning is important for medical students' 94.7% total of participants agreed (Figure 3a). When asked 'I am familiar with active learning techniques' 67.8% of students agreed with this statement (Figure 3b), with a large proportion of students choosing the neutral option (19.9%) for this question compared to only 1.5% neutral responses when asked if active learning is important in medicine.

The term 'active recall' also featured heavily in the focus group discussions with students from both campuses using the phrase when discussing their understanding of, and importance of, 'active learning'. Active recall may have been something they encountered outside of formal educational settings:

> *"I would say active recall is quite important, because when I first joined (medical) school and I've looked online on the best ways to study, I think every single Youtuber, every website said that active recall is the way to go."*
>
> UK Student

Despite this focus on 'active recall', students were generally aware of the difference between 'active' and 'passive' learning:

> *"I think passive learning is like ___ said; reading through your notes, writing your notes as well, and just copying the slides word for word. You aren't really like using your mind for that, you're just using repetition and trying to copy things down. But, I do that a lot, to be honest, because I think for active recall you have to first study it before you recall it."*
>
> UK Student

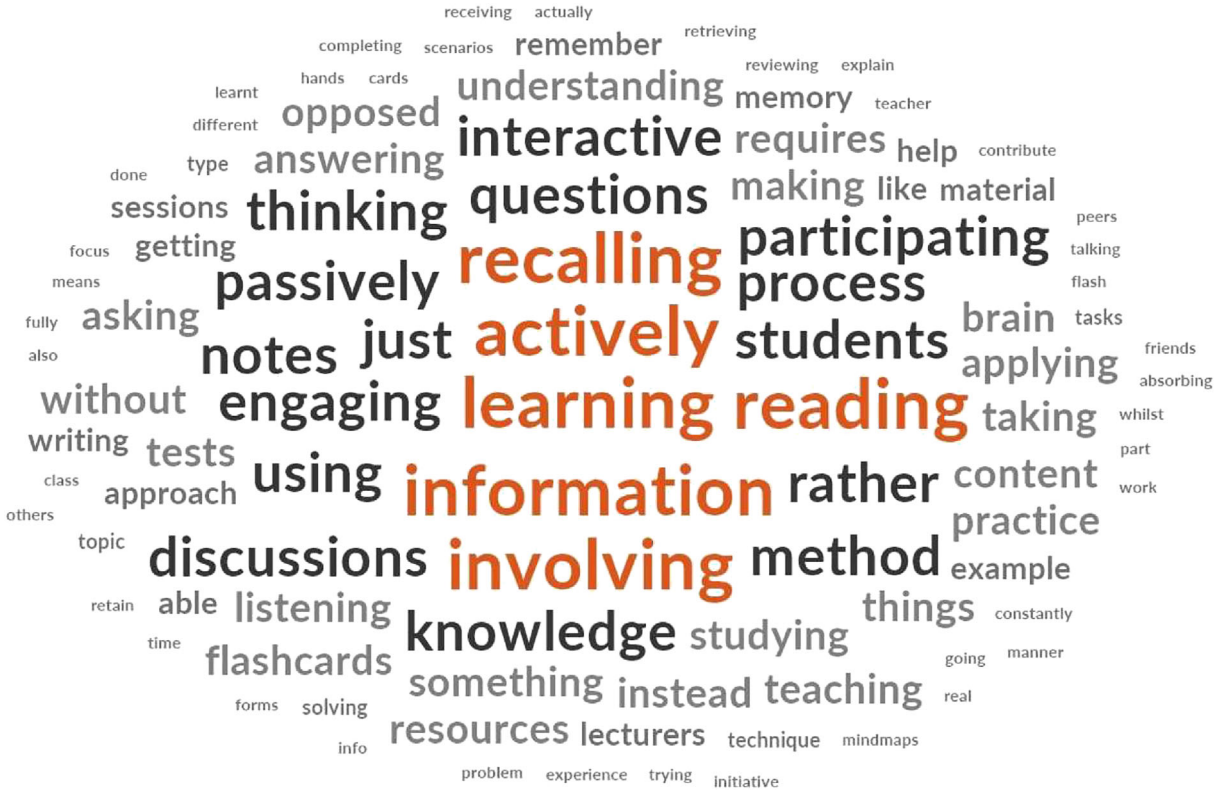

FIGURE 1 A word cloud of the most common words used in student definitions of active learning.

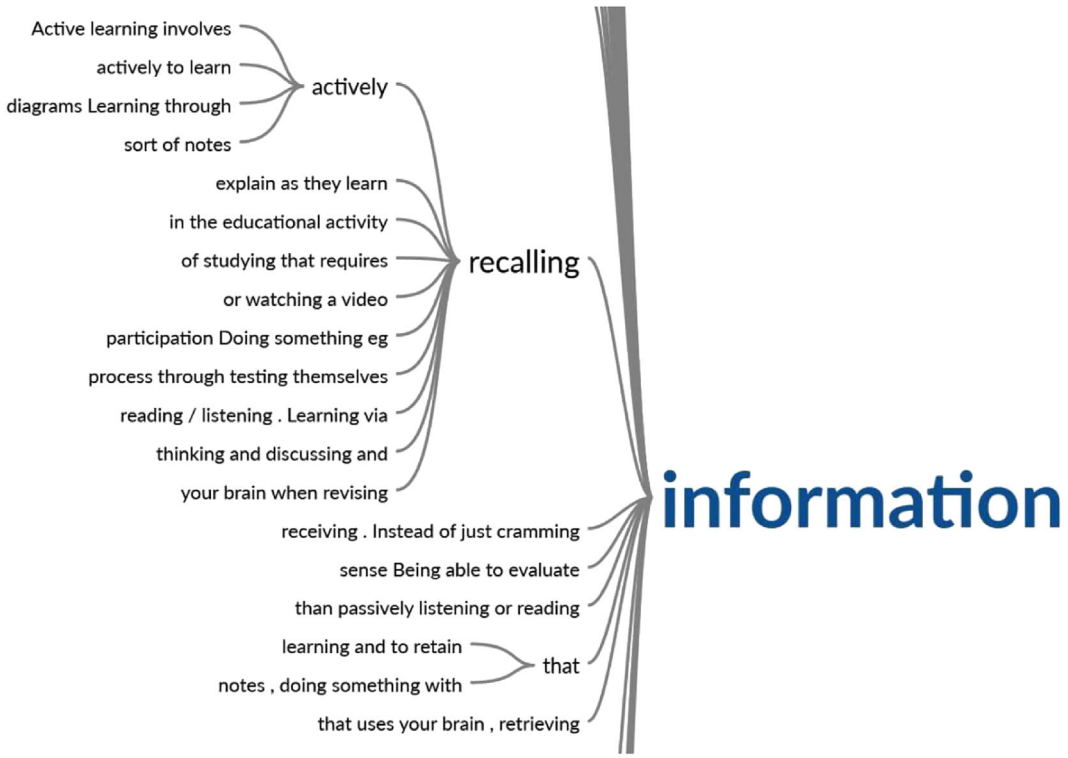

FIGURE 2 An example of a section of a word tree to demonstrate the links between 'active*', 'recall*' and 'information' in student definitions of active learning (centred on 'information' term search). Figure was generated using NVivo software 'text search' to create a word tree.

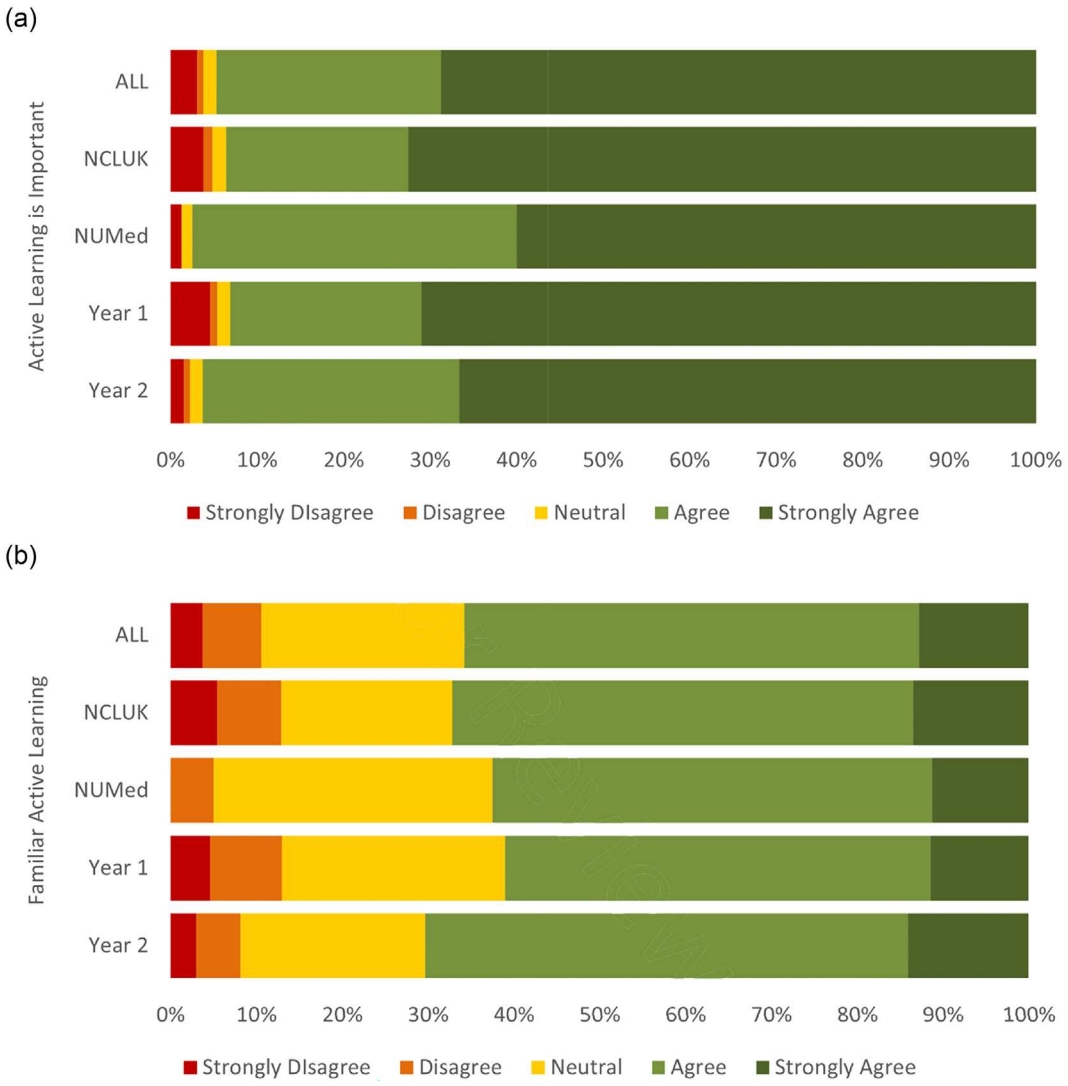

FIGURE 3 Bar graph showing the response to the Likert scale questions asking whether students felt active learning was important (a) and whether they were familiar with active learning techniques (b). Mann–Whitney U analysis did not find any significant difference in responses between campuses ($p = 0.089$ and $p = 0.769$, respectively) or between year groups ($p = 0.597$ and $p = 0.105$, respectively) for either question.

Students were able to describe examples of passive learning, when compared to more active approaches.

3.4 | Learning techniques

The frequency by which participants self-reported engaging in common passive and active learning techniques is shown in Table 2. The most common techniques (cumulative score of 'sometimes', 'often' and 'always') used by students for learning were items 2, (87.6%), 11, (92.1%), 12, (89.8%), 13, (91%), 14, (87.3%).

Mann Whitney U tests of central tendency showed multiple differences between campuses (Table 2) with UK students scoring themselves as more commonly engaging in items 2, 15, 16, 17, and NUMed students scoring themselves as more commonly engaging in items 5, 6, 7, 8, 9, 11,18. Focus groups highlighted flashcards as a widely used technique across both cohorts, deemed as a method of active recall. The use of flashcard applications was the main way students considered they engaged in active learning in their own time, followed by exam-style questions. Commercial applications were the most common form of generating and using flash cards with 'spaced repetition' for memorising information cited as the key benefit of this approach. Whilst some students did utilise other active learning techniques such as mind maps, and discussion groups, these appear to be in the minority. A good summary of a typical student approach to self-directed learning is demonstrated in the following quote:

> *"I think active learning is fairly important, even though until recently, I didn't really implement it in the same way most people do with* [commercial flashcard application]. *I only started using flashcards a few weeks ago, but most of my active recall involves asking myself (questions) or*

TABLE 2 Frequency of learning techniques used by students.

Item number		All participant percentage scores					Mean		Median		
		Never	Seldom	Sometimes	Often	Always	NUMed	NCL UK	NUMed	NCL UK	*p*-value
1 (P)	I spend most of my study time memorising the lecture information.	4.1	14.3	40.6	35.7	5.3	3.3	3.2	3	3	0.245
2 (A)	I make my own notes when I study.	2.6	9.8	18.0	33.5	36.1	3.6	4.0	4	4	0.002*
3 (P)	I rewrite my notes when I study.	20.7	24.8	27.1	18.4	9.0	2.8	2.7	3	3	0.737
4 (A)	I design my own practice questions to aid my understanding.	13.9	19.5	19.9	25.6	21.1	3.1	3.3	3	3	0.196
5 (P)	I highlight my notes when I study.	27.8	21.8	15.0	18.8	16.5	3.5	2.4	4	2	<0.001*
6 (P)	I copy and paste online notes or lectures into my own notes.	21.1	24.8	23.7	21.4	9.0	3.0	2.6	3	2	0.011*
7 (A)	I draw mind maps and/or make summary tables when I study.	18.0	24.8	24.1	24.8	8.3	3.1	2.7	3	3	0.012*
8 (A)	I create my own mnemonics when I study.	16.5	20.3	25.6	27.4	10.2	3.2	2.8	3	3	0.031*
9 (A)	I design my own flow charts when I study.	27.1	22.2	24.1	18.8	7.9	3.2	2.3	3	2	<0.001*
10 (A)	I enjoy interactive small group sessions.	3.4	9.4	28.9	32.0	26.3	3.6	3.7	4	4	0.243
11 (A)	I look for extra resources (e.g YouTube videos, websites, textbooks etc) to aid my understanding.	2.3	5.6	24.1	33.8	34.2	4.3	3.8	4	4	0.001*
12 (A)	I do practice questions when I study for a topic.	1.9	8.3	23.7	35.3	30.8	3.8	3.9	4	4	0.425
13 (A)	I ask myself questions when I study.	1.9	7.1	26.3	37.6	27.1	3.9	3.8	4	4	0.813
14 (A)	I actively contribute ideas during group discussion.	2.3	10.5	39.1	32.0	16.2	3.5	3.5	3	3	0.747
15 (A)	I actively answer questions in class	6.4	17.3	39.1	28.9	8.3	3.0	3.2	3	3	0.024*
16 (A)	I use flash cards to aid my revision/ space repetition.	10.9	11.3	17.7	18.0	42.1	2.9	4.0	3	5	<0.001*
17 (A)	I do pre-reading before attending a class.	2.3	11.7	30.8	31.6	23.7	3.4	3.7	3	4	0.014*
18 (A)	I do extended reading after attending a class.	18.8	35.0	25.6	15.0	5.6	3.1	2.3	3	2	<0.001*
19 (P)	I learn better from attending a lecture than interactive sessions.	12.4	29.7	33.8	13.5	10.5	2.9	2.8	3	3	0.252

*Denotes significance at $p < 0.05$.Colour coding is arbitrary to visualise participant responses. Red ≤ 10%, Amber 10.1% - 20%, Light green 20.1% to 30%, Dark green ≥ 30.1%. In column 1 'P' indicates a passive technique, 'A' indicates an active technique.

> *the most helpful for me is quizzing my friends and my friends quizzing me. That's definitely where most of my active recall is done. It does help a lot and I think it is pretty important to implement active recall from time to time."*
>
> NUMed Student.

When active learning was used within teaching sessions, such as anonymised quizzing, or as activities in seminars and tutorials, students found those useful and engaging:

> *"They do those like activities … drag and drop, … I find them quite good because they're quite engaging and fun, and … that helps the information stick in my head more".*
>
> UK Student

Students benefit more from active, scenario-based learning than from traditional lecture methods:

> *"That's definitely how I learn a bit better, when you're given a clinical scenario and you have to apply your*

TABLE 3 Factors influencing, and potential barriers to, active learning.

Item number		All participant percentage scores						Mean		Median		
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total agree	NUMed	NCL UK	NUMed	NCL UK	*p*-value
1	I feel confident to adapt active learning style even when it is new to me.	1.5	9.0	35.3	43.6	10.5	54.1	3.7	3.5	4.0	4.0	0.165
2	I find creating mind maps and/or summary tables efficient for my time management.	9.8	19.9	25.6	32.7	12.0	44.7	3.7	3.0	4.0	3.0	<0.001*
3	I feel comfortable answering questions in front of my groupmates.	2.6	12.8	26.3	48.5	9.8	58.3	3.4	3.5	3.5	4.0	0.210
4	I feel comfortable answering questions when my groupmates actively participate in the classroom discussion.	1.5	8.6	19.9	47.7	22.2	69.9	3.9	3.8	4.0	4.0	0.473
5	Relationship with my groupmates influences my classroom participation.	2.6	6.8	15.4	44.0	31.2	75.2	3.9	4.0	4.0	4.0	0.542
6	Having the camera on increases my participation and interactivity during online sessions.	21.4	29.7	23.7	18.4	6.8	25.2	2.9	2.5	3.0	2.0	0.012*
7	I participate more actively when I am interested in the topic of discussion.	0.4	1.5	11.3	44.0	42.9	86.8	4.2	4.3	4.0	4.0	0.117
8	I participate more actively when I am confident in my understanding of the topic of discussion.	0.4	1.5	4.5	30.8	62.8	93.6	4.5	4.6	5.0	5.0	0.424
9	Physical factors such as adequate sleep and satiety influence my classroom participation.	1.1	4.9	13.9	36.8	43.2	80.1	4.1	4.2	4.0	4.0	0.912
10	My previous exposure to interactive sessions affects my classroom participation.	1.9	8.6	26.3	42.1	21.1	63.2	3.9	3.7	4.0	4.0	0.185
11	Group discussion during the activity contributes to my understanding of the course material.	0.4	3.0	21.4	53.4	21.8	75.2	4.0	3.9	4.0	4.0	0.254
12	I engage more actively during online sessions if I am familiar with the software applications (e.g. zoom, OMBEA, Socrates).	0.4	3.0	21.4	53.4	21.8	75.2	3.8	3.4	4.0	4.0	0.030*
13		3.0	10.5	25.2	40.6	20.7	61.3	3.7	3.6	4.0	4.0	0.483

TABLE 3 (Continued)

Item number		All participant percentage scores						Mean		Median		
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total agree	NUMed	NCL UK	NUMed	NCL UK	*p*-value
	I participate more actively when I know the teacher well.											
14	The teacher's expertise in the topic of discussion motivates me to participate in the classroom discussion.	2.3	3.0	22.9	43.6	28.2	71.8	4.2	3.8	4.0	4.0	0.001*
15	The teacher's tone of expression during the session influences my classroom participation.	0.8	3.0	10.5	39.8	45.9	85.7	4.3	4.3	5.0	4.0	0.408
16	I participate more actively when the teacher employs questioning methods that stimulate critical thinking.	0.4	3.0	24.8	41.4	30.5	71.8	4.0	4.0	4.0	4.0	0.548
17	I participate more actively when the teacher employs questioning methods that involve factual recall.	0.8	8.3	27.8	42.9	20.3	63.2	3.8	3.7	4.0	4.0	0.932
18	I participate more actively when the teacher gives reassurance for us to voice out.	2.3	4.9	22.9	41.7	28.2	69.9	3.9	3.9	4.0	4.0	0.876
19	I participate more actively when the teacher appears experienced in conducting active learning sessions.	0.4	3.8	22.9	45.5	27.4	72.9	4.1	3.9	4.0	4.0	0.050*
20	The teacher's enthusiasm makes me more interested in the group activity.	0.4	1.1	13.9	33.1	51.5	84.6	4.3	4.3	4.0	5.0	0.612
21	I engage in the classroom teaching better when there is an inclusion of break in between the session.	1.9	9.4	28.2	31.2	29.3	60.5	3.6	3.8	4.0	4.0	0.125
22	I feel more motivated to join a group discussion when the learning content is relatively uncomplicated.	0.8	5.3	26.7	38.3	28.9	67.3	4.1	3.8	4.0	4.0	0.054
23	I feel more comfortable to answer questions during small group teaching (e.g. seminars) as compared to large	0.4	1.5	14.3	30.5	53.4	83.8	4.2	4.4	4.0	5.0	0.004*

(Continues)

TABLE 3 (Continued)

Item number		All participant percentage scores						Mean		Median		
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total agree	NUMed	NCL UK	NUMed	NCL UK	*p*-value
	group teaching (e.g. lectures).											
24	I feel more confident contributing in discussion when a small group teaching is further divided into subgroups.	1.5	6.0	20.3	33.8	38.3	72.2	3.9	4.1	4.0	4.0	0.239
25	I find length of teaching sessions affects my classroom participation (e.g. 1 hour vs 2 hours).	1.9	4.9	15.0	33.1	45.1	78.2	4.1	4.2	4.0	4.0	0.943
26	I participate more actively in group discussions during physical classes as compared to online classes.	0.8	2.6	15.0	30.1	51.5	81.6	4.1	4.4	4.0	5.0	0.013*
27	I participate more actively when the aim of session is made clear at the beginning of the class.	1.5	6.0	30.5	36.1	25.9	62.0	3.9	3.8	4.0	4.0	0.715
28	I engage better during classroom discussion when it is circular seating arrangement as compared to sitting in rows.	4.5	13.2	40.6	26.3	15.4	41.7	3.3	3.4	3.0	3.0	0.876
29	Seating arrangement during physical sessions influences my classroom participation (e.g. circular vs rows).	6.0	15.4	38.7	25.6	14.3	39.8	3.2	3.3	3.0	3.0	0.384
30	Physical learning environment influences my engagement during the teaching sessions (e.g. temperature, chairs, space).	3.4	6.8	24.4	42.1	23.3	65.4	3.9	3.7	4.0	4.0	0.158

*Denotes significance at $p < 0.05$.Colour coding is arbitrary to visualise participant responses. Red ≤ 10%, Amber 10.1% - 20%, Light green 20.1% to 30%, Dark green ≥ 30.1%.

> *learning to it and think through the problem rather than being told something that you need to follow."*
>
> UK Student

3.5 | Factors influencing active learning participation

Table 3 shows the responses of participants to 30 items examining factors influencing and potential barriers to active learning. Contextual factors had the highest agreement scores, such as item 8, (93.6%) and item 7, (86.8%). This was followed by teacher factors such as items 15, (85.7%) and 16, (84.6%).

Mann–Whitney U tests of central tendency found significant differences between campuses with NUMed students agreeing more with items 2, 6, 12, 14 and 19. UK students agreed more with items 23 and 26.

Some items did show differences by sex (not shown in table) where participants identifying as male reported agreeing more with item 1, $p = 0.03$, but participants identifying as female reported

agreeing more with items 15, $p = 0.039$, 22, $p = 0.047$, 24, $p = 0.009$ and 25, $p = 0.046$.

The focus groups highlighted a number of factors that influenced students' engagement in active learning. For instance, inadequate time and exhaustion emerge as significant factors impeding students' adoption of active learning methods.

> *"… .with active learning, you need the time and space to constantly see that information, and what* [commercial flashcard app] *does for you is that it already implements that. You don't have to force yourself to remember …"*
>
> NUMed Student

> "*I feel like active learning can take such a massive chunk of my time, and if I know that I'm coming back from university … I just want some time to relax. I have been in university all day and used up most of my brain, I don''t want to actively learn after that. Sometimes I just won''t bother because I'm too exhausted.*"
>
> UK Student

Nevertheless, students acknowledge the importance of active learning.

> *"… I think it can be quite time-consuming and it can be disheartening if you don't know the answer after studying for an hour, so I need to do more active recall. But it is definitely the best way to learn …"*
>
> UK Student.

Students' self-directed learning methods were often assessment driven, with flashcards and attempting pre-prepared questions (such as those provided by the school or through peers or online question banks) considered a way of improving 'active recall' for exams. This also manifested in a number of suggestions for ways to improve formal teaching would be to provide more questions:

> *"The only thing I can think of is* [for the school] *to generate more questions for us to test out, because sometimes it can be hard to find questions online."*
>
> UK Student

Teacher factors also had an impact on participation in active learning, both positive and negative. If a teacher was encouraging and engaging then students were more likely to enjoy and feel they benefited from such sessions, particularly when teachers had good session management. Poor session management by teachers negatively impacted student appetite for active learning:

> *"I've been in seminars where the delivery of certain things affects the mood in the room. I can see everybody is demotivated immediately."*
>
> NUMed Student

Another critical factor affecting active learning during instructional sessions is group dynamics. Students were less inclined to engage in active learning tasks within groups composed of unfamiliar peers, particularly if they were unprepared for the session or lacked confidence in the subject matter. This reluctance was further intensified by a fear of embarrassment from potentially incorrect responses in the presence of unfamiliar peers or in environments with less supportive instructors.

> *"In all seminars, the groups we tend to be in are usually made up of our friends. So I'm more likely to engage because I'm quite comfortable with them and you know that you are in a safe zone - they're not going to make fun of what you say."*
>
> UK Student

It was clear that feelings of 'safety' in active learning teaching sessions, with both teacher and peer factors important in creating a safe environment. When students felt safe with peers and teachers they engaged more in sessions.

> *"In the first semester, I remember I would always crawl into my shell, and just wait for others to tell out the answers. But then, little by little, I don't know how I overcame that, I started contributing more towards the class and towards the sessions, especially in the seminars. … You just are like, 'okay, my friends are also with me here. If I get something wrong, they will also not be against it. They'll probably understand, or they'll be like, okay, you've tried'. … So that's very important and for self-development, I think, and for confidence, that's good."*
>
> NUMed Student

3.6 | Overall results link to research aims

The results met research aim 1 by discovering that students defined active learning as 'active recall' to gain knowledge. The quantitative data in Table 2 showed that students used a mix of active and passive learning techniques, but the focus is largely around knowledge recall (research aim 2). This was further supported by the qualitative data where 'active recall' techniques such as flashcards were common. Research aim 3 was met since students reported reasons why they may/may not participate in active learning. Quantitative data in Table 3 showed that these were linked to interest of knowledge of a subject and how teachers engaged with students. Again, this mirrored the qualitative data where 'feeling safe' in active learning sessions was important to enable engagement.

4 | DISCUSSION

This study explored students' perceptions of active learning, including their understanding of the concept, the learning activities they engaged in, and the factors affecting their engagement with these

methods. The findings revealed that students recognised the importance of active learning for their educational development. However, their perception and definition of 'active learning' primarily revolved around the concept of 'active recall'.

There was a notable difference in the learning strategies between the two cohorts which seemed to stem from their approach to interacting with taught sessions. UK-based students generally used more active techniques and prepared for sessions in advance, whereas NUMed students were more inclined to use more passive techniques such as reviewing material and extending their learning after the sessions. Despite these differences, both cohorts favoured flashcards and exam-style questions as their preferred independent learning techniques, employing them for 'active recall' and categorising them as 'active learning' strategies.

Time emerged as a critical factor in the selection of independent learning techniques, with students opting for active methods that offered tangible benefits in a shorter period, such as flashcards and practice questions. While active learning was valued within the context of taught sessions, group dynamics and feelings of 'safety' significantly influenced student participation. Additionally, for NUMed students, the role of the teacher was a more significant factor in influencing engagement than it was for their UK-based counterparts, but again this linked to the feeling of safety and comfort in sessions.

4.1 | Active learning vs active recall

The analysis reveals that a significant number of students equate 'active learning' primarily with 'active recall,' although active learning encompasses a wider array of techniques, including discussions, group work and flipped learning. While active learning techniques are widely acknowledged as potent tools for enhancing learning, the extent of their effectiveness compared to passive learning methods remains a topic of debate.[10] Active recall involves techniques that promote the repeated testing and retrieval of information,[38,39] that are potentially more effective than other active techniques such as concept mapping.[40] Active recall is, therefore, an active learning technique, but could be considered to be narrow in its scope compared to the multiple techniques that encompass active learning, where a 'multimodal' approach to learning and teaching is considered good practice.[41] The popularity of active recall techniques with students could be attributed to the immediate feedback and perceivable improvement in retention, particularly valuable for examination preparation. This perception is further influenced by educational content on platforms like YouTube, which praise active recall as a superior revision method, and commercial question banks and flashcard applications that highlight the efficacy of active recall. This raises other risks around students accessing content outside of classroom teaching that may not be fully reliable.

4.2 | Learning techniques used by students

Students still tended to make traditional notes (written or electronic) from taught sessions such as lectures. However, these notes were often converted to electronic flashcards, or other short-form notes to be used for active recall. Exam-style questions also constituted a major part of many students' independent learning strategies. These practices align with what is traditionally categorised as 'surface' learning, which focuses on memorisation, and 'strategic' learning, which is driven by assessment outcomes.[42] Such methodologies are perhaps expected, considering the participants in this study are medical students facing the demands of a content-rich curriculum coupled with significant time constraints. This environment incentivises a more strategic learning approach. Indeed, there is evidence that in preclinical years, students that adopt a strategic approach to learning perform better in end-of-year assessment (Mainly MCQ style) compared to those adopting a surface learning strategy.[43] However, for clinical assessments a deep approach resulted in better performance.[44]

If students wanted to find more information about a topic, their preferred method was through more 'passive' learning methods such as reading e-books, watching YouTube and using online education platforms/websites (both free and paid for). The use of online methods dominated over more traditional methods such as utilising physical textbooks. So whilst student do engage in active learning in their independent study, the focus is on high-volume, but superficial, short-term gain.

In formal teaching sessions that employed active learning techniques aimed at fostering knowledge construction and application, students generally perceived these as beneficial and engaging. This observation aligns with previous findings that deep learning techniques enhance student satisfaction.[45] This study did not directly assess student perceptions of learning gain, which may be lower in active learning sessions compared to passive instruction,[31] but the qualitative data does suggest students are aware of the benefits to their learning of undertaking active approaches in taught sessions.

4.3 | Factors influencing engagement in active learning

Students prefer 'high-yield' learning techniques in their independent study time, driven by a 'cost–benefit' analysis that balances assessment demands against efficient time management. Flashcards and question-answering were seen by students as the most efficient active learning techniques. There is reluctance to engage in 'time-consuming' active learning methods such as mind mapping, and flow charts that transform information and are more holistic in their approach, despite understanding their potential for deeper understanding. The choice of techniques that encourage memorisation and recall in these students may reflect the nature of science degrees such as medical degrees where information overload may be a factor and, in UK medical degrees at least, where multiple choice style questions such as the 'single best answer' format has become the dominant assessor of knowledge. This raises questions of whether medical schools should reassess the types of assessments utilised, to move away from fact-based exams to a more holistic approach such as the programmatic assessment model proposed by van der Vleuten.[46] This,

in the UK at least, is, unfortunately, more difficult since medical schools need to prepare students for the incoming UK Medical Licensing Assessment (MLA) in the form of the Applied Knowledge Test (AKT), and ultimately Royal College assessments.

In sessions requiring a broader range of active learning strategies—like group tasks, discussions and case studies—group dynamics significantly influence engagement and enjoyment for both UK and NUMed students. Consistent with findings by White et al,[47] students preferred working with friends, albeit acknowledging potential distractions. Fear of negative evaluation/outcome emerged as a barrier for both sets of students and is a known cause of anxiety for students participating in taught active learning sessions. UK students' anxiety centred on peer relationships, whereas NUMed students' concerns were more related to teacher interactions. This need for feeling of being 'safe' in teaching sessions, whether it be safe amongst peers, or teachers creating a safe environment, which resonates with previous studies discussing increased anxiety in students participating in active learning teaching sessions[26–29] Any difference between cohorts with respect to the cause of the anxiety (whether teacher or peer) may reflect the more hierarchical educational culture prevalent in Southeast Asia, as observed in this and other regional studies.[22,48] Indeed, the study by Guilding et al22, reflects on experiences teaching across the same UK and NUMed cohorts covered in this current study, where factors such as worries of speaking in a second language, transitioning to a UK style of teaching where more emphasis is on learning through discussion and problem solving, and the traditional role of the teacher as one who should not be challenged, may explain the findings that NUMed students cited 'teacher influences' as more likely to be a barrier to engaging in active learning than UK students.

4.4 | Strengths and limitations

A low overall low response rate (30%) from students limits generalisability, however, a strength of the study is that transnational insights are drawn from medical students from various social and cultural backgrounds who study in both UK and NUMed campuses, depicting a clearer understanding of cross-cultural perspectives improves generalisability of the findings. The corroboration between the quantitative and qualitative data enhances consequential validity. Our survey was developed de novo for this study, which has not undergone formal psychometric evaluation but was based on previously validated surveys.[33,34]

The mixed methods nature of the study also enhances the integrity, comprehensibility and applicability of the findings through gaining quantitative information from a larger sample size, whilst the qualitative data enabled a more detailed understanding of the reasons why students had particular perceptions of active learning. Furthermore, the principal investigator of this study [WH] was deliberately excluded from being the moderator for the focus group discussions. This eliminates the issues of power that restrict the participants' will to propose their ideas freely. There is also the potential of selection bias in the cohort due to convenience sampling.

5 | CONCLUSIONS

Medical students in both the UK and at NUMed utilise active learning techniques and recognise their value. However, their understanding of active learning tends to focus more narrowly on active recall rather than the broader concept encouraged in literature, which promotes deeper learning. Similarly, students tend to prioritise learning methods perceived as efficient in time and expected gains, potentially leading to surface-level learning of facts and figures, rather than deeper understanding.

Learning points

- To enhance effective learning, particularly in medical education, it is advisable for teaching staff to collaborate with students to define active learning during study support sessions at the course outset, to maximise the effectiveness of active learning-based teaching sessions through co-construction.
- Since staff and students understanding of what active learning is (and the types of active learning that are most effective), may differ, a student-centred, student informed, approach to teaching and learning should be adopted through co-production of teaching sessions based on active learning techniques.
- Students understand the value of active learning but choose to engage in superficial 'high-yield' short-term techniques. Teaching staff should provide help, guidance and support to enable students to better construct their knowledge through broadening the range of active learning techniques utilised in their independent learning time.
- Teaching staff should incorporate critical evaluation of study skills techniques into study skills support. Students are heavily influenced by external content that may not be reliable, but determines the type of learning techniques utilised, such as a heavy reliance on active recall.
- Staff training should be offered to raise awareness of the reasons students disengage in active learning sessions. This should focus on awareness of the importance of managing student group relationships, and the way in which sessions are run - such as reducing the amount of direct questioning of students and other classroom practices known to increase anxiety in students. This would particularly benefit international students and may help reduce attainment gaps amongst these students.

AUTHOR CONTRIBUTIONS

All authors have contributed to writing, reviewing and modifying manuscript drafts and have agreed to publication. Wendy Heng, Mei Hui Ho and Xiu Hui Mah devised the project idea and gained initial funding. Jun Jie Lim and Nabilah Huda Binti Ahmad Syamsury were student interns employed to gather research data and run the focus groups. Emma Haagenson supervised the UK arm of the research and Edmund Liang Chai Ong and Paul Hubbard the NUMed arm. Edmund Liang Chai Ong and Paul Hubbard supported Wendy Heng, Mei Hui Ho and Xiu Hui Mah throughout the research process from inception to manuscript writing.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, PH, upon reasonable request.

ETHICS STATEMENT

This study is approved by both the Newcastle University Ethics Committee (Ref: 24222/2022) and the NUMed Research Management Group (RMG).

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