Students' Attitude Toward Active Learning in Health Science Education: The Good, the Challenges, and the Educational Field Differences

Surachai Leksuwankun, Suwiwat Bunnag, Amornrut Namasondhi, Thanakit Pongpitakmetha*, Wannarasmi Ketchart, Danai Wangsaturaka and Chandhanee Itthipanichpong

Department of Pharmacology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Active learning is an important shift in pedagogical paradigms in recent decades. Previous studies establish many benefits from this learning strategy. However, an implementation is challenging. This study aimed to clarify an explanation of the benefits and challenges of active learning from various educational field students' perspectives. This study was conducted in a general education course at Chulalongkorn University. Underpinning with a mixed-method study, 22 undergraduates were interviewed in a focus group study. Results were analyzed with deductive thematic analysis and contributed to 23 items in close-ended questionnaires for a cross-sectional quantitative survey study. Notably, 222 undergraduates revealed their attitude toward active learning including benefits and challenges. Quantitative data were analyzed with analytical statistics including the Mann-Whitney U test, and these results are supported by thick descriptions derived from the qualitative data. This study revealed students' attitude in benefits of active learning dividing into cognitive domain, student efficacy, and 21st century skills, and also challenges of active learning in teachers, students, and pedagogical aspects. Health science undergraduates tended to agree that active learning exposure enhances effective active learning than non-health science undergraduates ($U = 2843$, $p = 0.029$). An educational theory is also discussed with these results, and an educational implication to achieve an effective learning strategy is presented in this study.

Keywords: active learning, health science, attitude, mixed method, undergraduate, higher education

INTRODUCTION

Active learning is an important shift in pedagogical paradigms in recent decades (Misseyanni et al., 2018). Although there is no consensus on a universal definition, the meaning is consistent that students should play an active role in their own learning process (Bonwell and Eison, 1991; Coates, 2010). It is quite different from traditional didactic learning which students learn with rote memorization and reproduce in the examination (King, 1993). Active learning makes students learn through a broad range of construction processes such as reflection, analyzing, synthesizing, and evaluation (Bonwell and Eison, 1991; Anthony, 1996). These processes require students' metacognition and higher-order thinking (Bonwell and Eison, 1991). The student's role not only changes as the teacher's role but also transforms from sage on the stage into a guide on the side

(King, 1993). This practice moves from teacher-centered learning to student-centered learning in higher education. Several teaching methods are proposed to promote active learning, for example, problem-based learning, team-based learning, project-based learning, peer learning, and also interactive classroom with audience response systems (Koles et al., 2005; Abate et al., 2011; Coorey, 2016; Jacob et al., 2016; Marbouti et al., 2018).

Underpinning with the educational philosophy, active learning is grounded on the constructivism paradigm. Students construct their cognitive structure by their own experience extending from their prior knowledge called meaningful learning. Moreover, it provides opportunities to learn in authentic simulation which probably helps students solve complex and realistic life problems. In terms of collaborative learning rooted in social constructivism, students learn from social interaction with others and construct their knowledge through conflict resolution (Windschitl, 2002; Cooperstein and Kocevar-Weidinger, 2004; Michael, 2006).

The advantages of active learning over traditional learning are an increase in students' performance and a decrease in failure rate. Nevertheless, traditional learning may provide more benefits in larger details and bigger classes (Shin et al., 2015; Falconer, 2016; Kim et al., 2019). An academic performance would be improved when students learn by active learning strategy (Tsang and Harris, 2016). Additionally, in the aspect of student perception, active learning helps them create attractive interests, lead to better understanding, and improve peer interaction. Moreover, active learning facilitates the feedback process from the lecturer and clarifies students' misconceptions (Welsh, 2012; Richa et al., 2013).

Despite the fact that an education imperative was launched for decades resulted in positive outcomes, there are many challenges for teachers to implement an effective active learning strategy on their perceptions to avoid excessive preparation time, low level of students' participation, difficult implementation, traditional learning culture, and huge classroom (Michael, 2007). Correspondingly, students also perceive that active learning is time and resource-consuming (Welsh, 2012). For more effective active learning, students gave feedback that instructor technique, appropriate questions, effective instruction on group discussion, and characteristics of students in a classroom are the key factors for enhancing decent practice (Welsh, 2012).

In Thailand, sociocultural diversity in Southeast Asia influenced a pedagogy strategy. A previous primary focus was a rote learning model (Rhein, 2017). Later, The National Education Reform Act of 1999 of Thailand encouraged active learning and critical thinking skills development in a classroom. Nowadays, the Office of the Higher Education Commission (OHEC) suggests many key changes for education reform toward Thailand 4.0 strategy including active, passion-driven, and personalized learning (Buasuwan, 2018). This is a challenging situation for educational development and implementation overcoming the previous traditional culture. To clarify more benefits and challenges on active learning strategy, we conducted this study to explore various educational field students' attitudes including their implications (UIS, 2015).

METHODS

This study was conducted during the Drug in Daily Life course. It was three credit general education course established in 1996 and administrated by the Department of Pharmacology, Faculty of Medicine, Chulalongkorn University. The course description is about basic knowledge of common drug use in daily life (basic pharmacology, drug administration, form of drug, and adverse drug event) and critical appraisal of online drug information. In the academic year 2019, this course was approved to be next generation two level by the criteria of the General Education Center, Chulalongkorn University. The prerequisite of the next generation two level course must be composed of plenty of active learning, using learning management systems, and focusing on life skills development for undergraduates. Active learning strategies in this course are 62% of overall learning time. They contained various types of active learning including small group discussion about common problems of drug usage in daily life, site visit learning at snake farm about venom extraction, case-based learning about adult vaccination, flipped classroom about contraceptives, interactive lecture with audience response system, self-reflection in the logbook with feedback from the facilitator, and project-based learning. For example, 5–6 students in each small group discussion were assigned to solve the different common myths in drug usage with guided questions by searching the literature. In addition, 8–11 students in each group of project-based learning were guided by a team mentor to propose a project question and solve each question based on the learner's interests. This course was freely opened for multidisciplinary students in Chulalongkorn University with a maximum of 200 students per semester.

We conducted the mixed-method study in a single large institution. This cross-sectional study was divided into two phases. The first phase was launched in the academic year 2019. We conducted the focus group interview for qualitative data collection among the participants by voluntary sampling in the early few weeks after course orientation. Each of the four focus groups contained 5–7 participants. The participants were asked semi-structured questions such as definitions, experiences, benefits, and challenges of active learning from their point of view. The results from the first phase were analyzed with deductive thematic analysis.

The second phase was launched in 2020, for which we developed a quantitative questionnaire from the previous data of focus groups. We collected the data from the cross-sectional survey in the academic year 2020 (**Figure 1**). The survey was conducted after the approval from the Institutional Review Board, Faculty of Medicine, Chulalongkorn University (IRB No. 652/62).

For the quantitative phase, the sample population was undergraduates registered for the Drug in Daily Life course between academic year 2019 and 2020. Sampling method was voluntary sampling. Sample size was calculated with a 95% confidence level, 5% margin error, 50% response rate, and a 450 finite population. The minimal sample size was determined to be 208 participants. After deductive thematic analysis of the qualitative data, 19 subthemes were integrated into a 23 item

FIGURE 1 | Framework of the study.
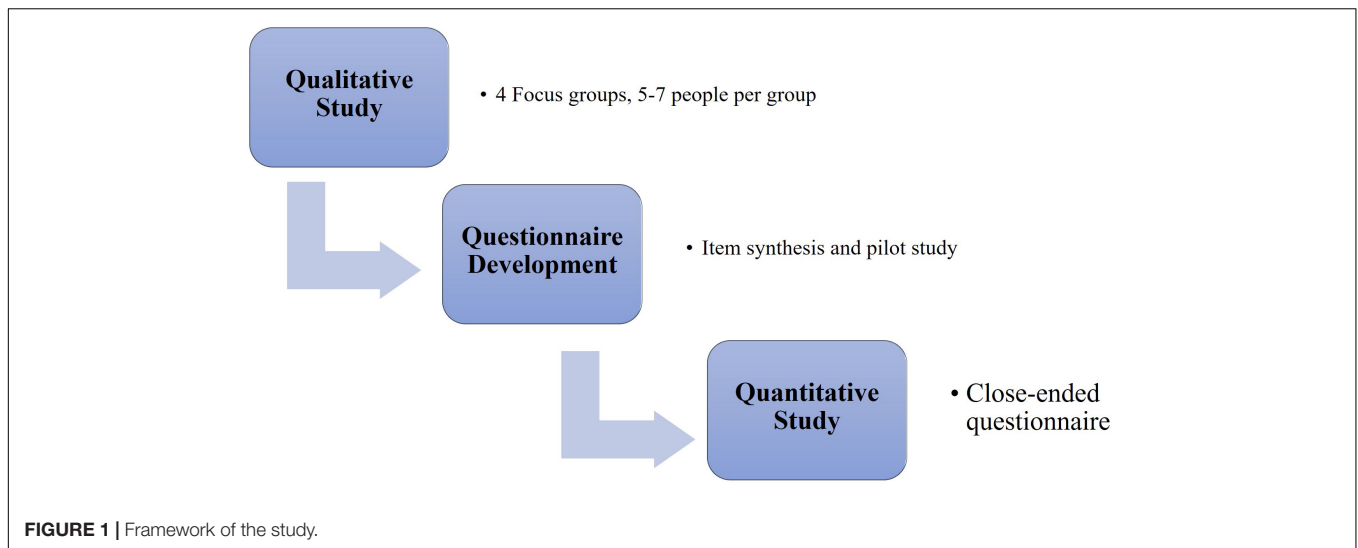
close-ended questionnaire including 4 items to clarify developing 21st century skills subthemes (**Table 1**). The questionnaire was divided into 3 parts and written in Thai language. The first part contained demographic questions including year of study, field of education (health & non-health science), and domicile region. The second part contained open-ended questions about attitudes toward active learning. The last part was comprised of 23 items using a 5-point Likert scale asking students on their agreement with statements about the benefits and challenges of active learning derived from our thematic analysis.

It was piloted with undergraduates, and a minor revision was performed before data collection. The survey process was launched in both paper-based form and online forms, *via* Google Forms, with a voluntary and anonymous approach to participants. A further analytical study was performed to compare the association in attitude toward active learning and demographic data.

The statistical results were analyzed by IBM SPSS Statistics for Windows, Version 22.0. The descriptive statistics were presented in frequency and percentage. The analytical statistics used the Mann-Whitney *U* test, since a Likert scale is not an absolute interval or ratio scale. Results from the Likert scale collapsed the strongly agree and agree categories together into one percentage representing agreed. All of the statistical results were triangulated with the qualitative data in the section "Results". A *p* value of < 0.05 was used in determine statistical significance.

TABLE 1 | Results of deductive thematic analysis and items in quantitative questionnaires.

Benefits of active learning	Challenges of active learning
Cognition	**Student factor**
• Increasing students' attention	• Students' interest
• Checking for students' understanding	• Students' attention
• Improving students' knowledge application	• Student's workload
• Improving students' long-term knowledge retention	• Students' assertiveness
	• Students' background knowledge
Self-efficacy	• Students' active learning acquaintance
• Encouraging students' pride	**Teacher factor**
• Building students' confidence	• Teachers' competence
21st-century skills	• Teachers' open-mindedness
• Developing students' responsibility skills	**Pedagogical factor**
• Developing students' collaboration skills	• Class size
• Developing students' critical thinking skills	• Topic scope
• Developing students' communication skills	• Time management
• Developing students' problem-solving skills	• Difficulty level of content

RESULTS

Participants

In the qualitative phase of this study, a total of 22 participants in focus group interviews were divided into four groups. The deductive thematic analysis revealed two main themes, namely, benefits of active learning and challenges of active learning. In the quantitative phase, the response rate was 39.86% ($n = 222$). Participant characteristics included health science undergraduates 19.35% ($n = 42$) and non-health science undergraduates 80.65% ($n = 175$). Year of study was mainly distributed into the first-year undergraduates 40.90% ($n = 90$) and the second-year undergraduates 40.00% ($n = 88$) (**Table 2**).

Benefits of Active Learning

This theme included seven subthemes comprised building students' confidence in learning process, checking for students' understanding, developing 21st-century skills, improving students' long-term retention of knowledge, improving students' knowledge application, encouraging students' pride in learning process, and increasing students' attention.

TABLE 2 | Participant characteristics and demographic data.

		Participants	
Field of education		**(n = 217)**	
Non-health science	Education	4.61%	(n = 10)
	Arts and humanities	4.61%	(n = 10)
	Social science	12.90%	(n = 28)
	Business and law	20.74%	(n = 45)
	Natural science, math, statistics	24.88%	(n = 54)
	ICT	3.69%	(n = 8)
	Engineering and architect	8.29%	(n = 18)
	Agriculture and vet	0.92%	(n = 2)
Health science		19.35%	(n = 42)
Year of study		**(n = 220)**	
Year 1		40.91%	(n = 90)
Year 2		40%	(n = 88)
Year 3		10.45%	(n = 23)
Year 4		7.73%	(n = 17)
Year 5		0.45%	(n = 1)
Year 6		0.45%	(n = 1)
Domicile		**(n = 216)**	
Capital city		36.11%	(n = 78)
Non-capital city		63.89%	(n = 138)

In the cognitive domain, active learning can check for students' understanding. Notably, 88.48% ($n = 192$) of participants agreed with this item. One participant said "Opinion expression is the process to check my understanding and active learning is not just memorization. For example, students have to read the assigned article before class and then discuss in a group and express their ideas and understanding." Of note, 73.85% ($n = 161$) of participants supported that active learning improved students' long-term retention of knowledge. One of the participants said "Active learning can be compared to the first time of bicycle riding, you cannot ride when people tell or show you how to ride. Furthermore, you do it yourself, you can ride a bicycle even after a long time without cycling. Therefore, it can be easily retrieved." Another participant added up "Like the Mathematics or Physics If you have ever calculated, you will be able to do it again in the examination." Similarly, in the long-term retention, 84.40% of participants ($n = 184$) agreed with "Active learning improves students' knowledge application." One of the participants said "The pros of active learning help students effectively practice thinking process which leads to better understanding, good memorization, and useful application. For instance, the interaction of teachers-students and students-students during language learning in both verbal and non-verbal ways results in using words in daily life providing with proper understanding and best memorization."

In self-efficacy, active learning encouraged students' pride in the learning process. Notably, 53.67% ($n = 117$) of participants agreed with this item. A participant said "For instance, students' interest and pride is one of the most important components in project-based learning. During the lecture, we

just listen to the teacher and apply that knowledge in our life without using our ideas. Contrastingly, we practice under our background knowledge with the teacher guidance during active learning class."

In 21st-century skills, active learning also developed these skills for undergraduates. Notably, 83.94% ($n = 183$), 78.44% ($n = 171$), 77.42% ($n = 168$), and 74.31% ($n = 162$) of participants agreed that active learning developed responsibility skills, critical thinking skills, collaboration skills, and communication skills, respectively. A participant said "Active learning develops critical thinking and creativity. In addition, it enhances student collaboration. The result is very appreciated to see various perspectives from others" (**Figure 2**).

Challenges of Active Learning

This theme included 12 subthemes that aim to develop an active learning classroom composed of defining topic scope, ensuring students' background knowledge, establishing students' interest, students' attention, open-minded teachers, competent teachers, active learning acquaintance, considering appropriate time management, proper difficulty level of content, assertive students, moderate student workload, and fit class size.

In the student factors, 84.86% ($n = 185$) of participants agreed that students' background knowledge was the important factor for effective active learning. A participant revealed "If learners do not understand the background knowledge and attend active learning class, they will stress. For example, in language learning, if learners do not have enough vocabulary in word-stock, they cannot interact in a language class, like a baby." Notably, 78.44% ($n = 171$) of participants agreed that students' workload was the limitation of active learning. A participant expressed "If learners do not have enough time to study or they have many of assignments at the same time, they will have little background knowledge to participate in that class. Thus, students struggle for being a good active learner." Also, 76.15% ($n = 166$) of participants agreed that shyness was the limitation of active learning. A participant said "The challenge of effective active learning is students' personality. In project-based learning, introverted students may feel difficult to communicate with new colleagues. Therefore, the ineffective active learning will occur."

In teacher factors, 92.66% ($n = 202$) of participants agreed that open-minded teachers were the factor enhancing active learning effectiveness. A participant said "Active learning creates more interaction between teachers and students. Teachers should not judge the open-ended answer. They should provide constructive feedback to close this gap." Notably, 91.28% ($n = 199$) of participants agreed that teachers' competency was the factor enhancing active learning effectiveness. A participant said "Teachers are the starting point that initiates active learning. The less competent they lead the class, the less effective active learning is."

In the pedagogical aspect, 86.24% ($n = 188$) of participants agreed that defining the scope of content could enhance active learning effectiveness. A participant said "In project-based learning, I study in-depth content from my interest, but it is not exactly the learning objectives. Therefore, I cannot do the examination." Notably, 82.57% ($n = 180$) of participants
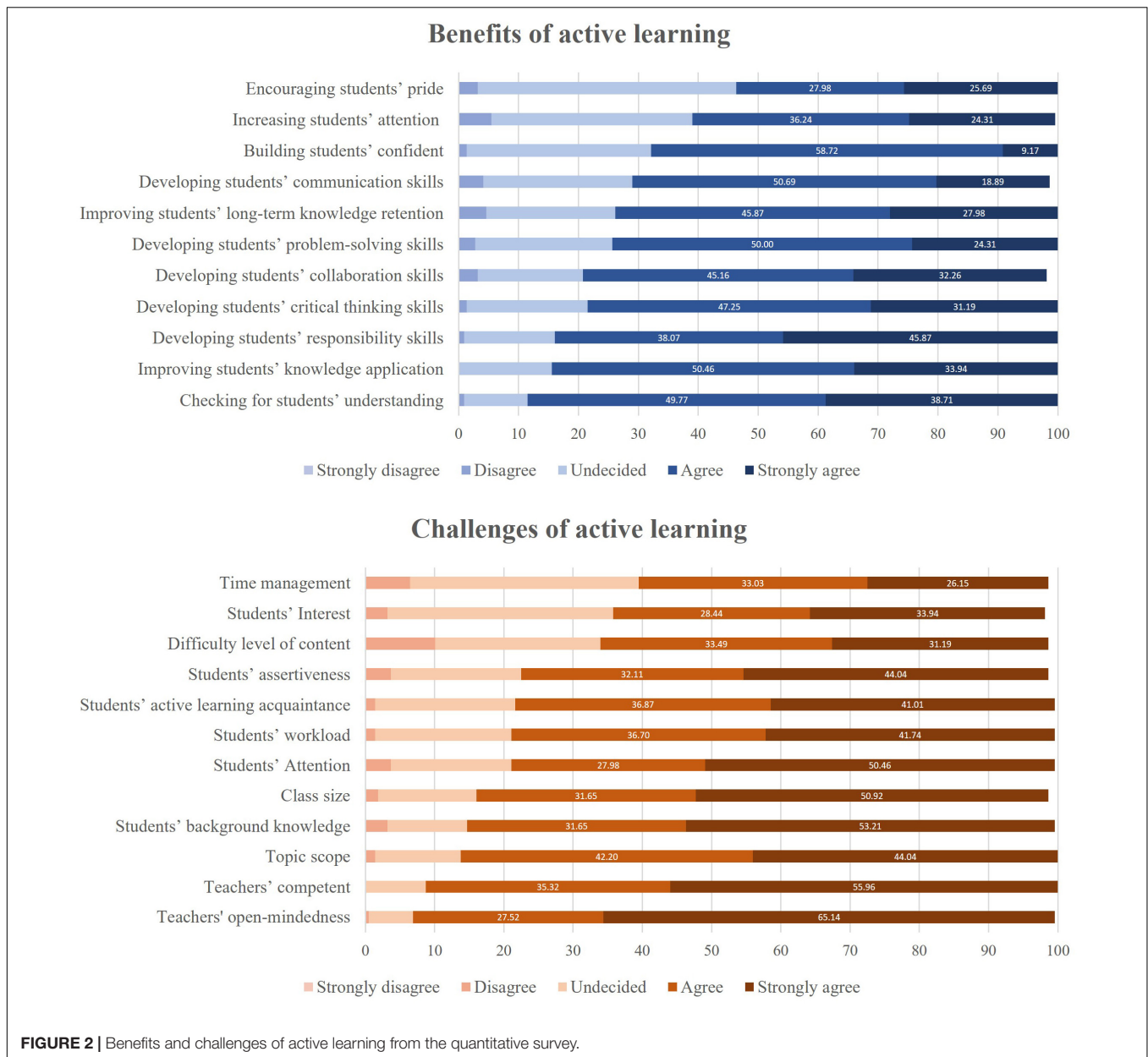
FIGURE 2 | Benefits and challenges of active learning from the quantitative survey.

agreed that large class size was the limitation of active learning. A participant said "Less is more. The lesser students per group are, the more effective active learning is. Teachers have more attention to facilitate students' active learning in small group learning" (**Figure 2**).

The Differences in Attitude Toward Active Learning

Year of student, urbanization, and educational fields affected the attitude toward active learning. In terms of the year of study, there were more first-year undergraduates who agreed on developing critical thinking skills than second-year ($U = 3,000$, $p = 0.007$) and third-year undergraduates ($U = 765$, $p = 0.044$). Moreover, there were more first-year undergraduates who agreed

on responsibility skills than second-year ($U = 3,037$, $p = 0.01$) and fourth-year ($U = 522$, $p = 0.024$) undergraduates. In the aspect of educational fields, our study showed that more health science undergraduates agreed on active learning acquaintance enhancing effective active learning than non-health science undergraduates ($U = 2,843$, $p = 0.029$). Finally, the urban domicile undergraduates agreed that shyness ($U = 4,153$, $p = 0.014$) was a limitation of effective active learning.

DISCUSSION

Our study mainly gathered information from the first-year non-health science undergraduates who enrolled in general education

courses in a single large institution. The strength of our study is the mixed-method study which provided the thick description from the qualitative study (focus group study and deductive thematic analysis) as well as the magnitude of concerns from the quantitative study (cross-sectional questionnaire). The result from this study supports the benefits of the active learning strategy and explores the challenge in implementing active learning, especially in the context that is unfamiliar with active learning. Further exploratory analytical study showed the difference in year of student, urbanization, and educational fields.

From our results regarding the benefits of active learning, active learning seems to make students obtain more academic achievement from the students' perspective. First, active learning enhances student cognition through meaningful learning constructed by their attentive learning process. Students retrieve their cognitive structure and apply it to solve the relevant problem easier. These results are in concordance with other studies. Students, also the faculties, perceive that they enjoy and learn better in active learning classes (Miller and Metz, 2014; Walling et al., 2017). Accordingly, active learning shows more assignment and examination score and higher learning achievement than traditional learning in effectiveness study (Fayombo, 2013; UIS, 2015). Second, active learning effectively enhances students' pride and confidence in their learning process similar to our student agreement (Paxman et al., 2011; Jeong et al., 2019). Students who achieve learning outcomes will pride and have self-efficacy. Moreover, self-efficacy can enhance the effectiveness of active learning similar to positive reinforcement (Corkin et al., 2017; Kustyarini, 2020). The explanation can be from higher student participation in the classroom (Linnenbrink and Pintrich, 2003). Concordantly, a study shows a moderately positive correlation between self-efficacy and active learning construction (Fook et al., 2015). Additionally, our study also shows that active learning develops 21st-century skills such as responsibility, critical thinking, and problem-solving skills. In collaborative learning, students also develop their communication and collaboration skills through social learning. It causes the increment of trust, harmony, and group accountability among members in a team (Nealy, 2005; Stalp and Hill, 2019).

Although there are many benefits from active learning, effective implementation is a big challenge. According to the result, three components of challenges are considered in this study comprising student, teacher, and pedagogical factors. In student factor, active learning will be effective when students have attention and interest in those topics of study (Walling et al., 2017). Teachers should ensure that students have proper background knowledge to extend from the baseline cognitive structure grounding on meaningful learning foundation. Moreover, teachers should gradually introduce active learning methods earlier for learning acquaintance (Mayer, 2002). Another thing to consider is students' workload. If they have several assignments or life tasks, they will not have enough time to attentively participate in the learning process (Ruiz-Gallardo et al., 2011). Similarly, student characteristics affect the active learning process since shyness and lack of confidence are the major obstacles of participation in active learning

classes. They can be solved by making student-student and teacher-student relationships or using an anonymous submitting system, such as an audience response system, which can elicit student engagement in the classroom (Simon et al., 2004; Stowell et al., 2010; Lema and Kassegn, 2015). In teacher factors, teachers' competence in active learning method is essential for effective teaching. Many teachers are still accustomed to traditional learning method. However, almost all of them are willing to develop their teaching skills (Miller and Metz, 2014). This is room for improvement by faculty development. In the pedagogical factor, appropriate class size is one of the key successes of active learning. Students perceive that they receive prompt feedback when they learn in a small class size. Results of a study in higher education are not concordantly supported by this point due to many confounding factors (Monks and Schmidt, 2011). Even if teachers can enhance student participation through many teaching techniques such as think-pair-share, show of hands, and audience response system in a large class, appropriate techniques applied in proper class size should be considered (Akerhielm, 1995). Also, in obviously defining topic scope, students perceive that they can actively study following study guide and learning objective.

The differences of attitude toward active learning among year-class are found in this study, but it has not been well described in a previous study in this specific context. First-year-class students agree more than higher-year-class students that they develop their soft skills from active learning including responsibility skills and critical-thinking skills. This may be a different experience from active learning in higher education due to different levels. In addition, health science students agree more than non-health science students that active learning acquaintance is important for an effective learning process. This may be from the differences in active learning methods across multiple education fields which should be proved for further study. The health science undergraduates tend to agree on active learning acquaintance enhancing effective active learning than non-health science undergraduates. The difference between health and non-health undergraduates toward this aspect has not been well described in a previous study. Both fields also use active learning strategies in their teaching (Carvalho et al., 2021; Church, 2021). Therefore, these differences should be studied more. In summary, active learning enhances student outcomes, especially academic achievement and 21st-century skills. From our study, almost all students also perceive these benefits and explain their mechanism. While benefits are well established, the implementation of active learning strategies in higher education is challenging to accomplish through student factors, teacher factors, and pedagogical factors, especially in a setting in which everyone is unfamiliar with active learning. If teachers understand these current barriers and solve or soothe them, active learning strategies will be more effective to enhance student outcomes.

Limitation and Further Study

Although this study has a limitation on the number of students in each educational field which is not equivalent to others, it can be generalized to the context in higher education due to

the inclusion from various educational field undergraduates. In addition, this study is survey research in which participants may have a recall bias both in focus group interviews and in questionnaire surveys. This study clarifies the benefits and challenges of active learning in higher education from students' perspectives. These explanations are provided with a thick description for more understanding in active learning. Further studies should focus on a strategy to maximize these benefits and simplify these challenges in an active learning classroom. Moreover, they should clarify different attitudes among the different educational field undergraduate.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Review Board, Faculty

of Medicine, Chulalongkorn University (No. 652/62). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SL contributed to conception and design of the study, data acquisition, data visualization, organized the database, performed the statistical analysis, interpreted data, and wrote the first draft of the manuscript. SB and AN contributed to conception and design of the study and data acquisition. TP contributed to conception and design of the study, data acquisition, and data visualization. All authors contributed to manuscript revision, read, and approved the submitted version.

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