

## ORIGINAL ARTICLE

# UNDERGRADUATE MEDICAL STUDENTS' ATTITUDE AND PREFERENCES TOWARD TRADITIONAL LECTURE VERSUS INFORMAL COOPERATIVE LEARNING

Norhasiza Mat Jusoh<sup>1</sup>, Husbani Mohd Amen Rebutan<sup>1</sup>, Myat Moe Thwe Aung<sup>1</sup>, Mohaslinda Mohamad<sup>1</sup>, Rohayah Husain<sup>1</sup>, Abdul Rahman Esa<sup>2</sup>, Salwani Ismail<sup>1</sup>

<sup>1</sup> Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Jalan Sultan Mahmud, 20400 Kuala Terengganu, Malaysia, <sup>2</sup> UCSI University, Terengganu Campus, Kawasan Perindustrian Bukit Khor, PT 11065, Mukim Rusila, 21600 Marang, Terengganu, Malaysia.

### ABSTRACT

*Cooperative learning is one of the active learning techniques. There are three commonly recognized types of cooperative learning groups, namely informal cooperative learning (ICL), formal cooperative learning and cooperative base groups. There is no study been done on ICL which relate to radiology teaching. The results of this study will provide evidence to support either traditional lecture (TL) or ICL is a more suitable teaching method for radiology teaching. This study was aimed to compare students' attitude and preference towards TL versus ICL in radiology teaching. This interventional study had been conducted among 52 third year Bachelor of Medicine and Bachelor of Surgery (MBBS) students at Universiti Sultan Zainal Abidin. They underwent both TL and ICL methods during eleven radiology lectures in classroom setting from September 2013 until July 2014. Subsequently, multiple items questionnaires regarding students' attitude and preferences towards TL and ICL were administered. These questionnaires had undergone validation process and revealed excellent internal consistency with Cronbach's Alpha of 0.90, 0.92 and 0.88 respectively. The mean total attitude score towards informal cooperative learning was (90.90) (SD: 11.73) significantly higher than the score for traditional lecture 85.46 (SD: 11.82) (p= 0.012). Students showed preference in ICL significantly in six domains. These domains were active involvement in the class, promotion of good rapport among classmates, getting an opportunity to help others, facilitation of understanding difficult materials, improvement of communication skills, opportunity for training to be a good leader and follower, and opportunity for enabling to participate in sharing information, making decision and problem solving. ICL method is recommended in radiology teaching because students demonstrated better students' attitude and preferences in the learning sessions as compared to TL.*

**Keywords:** cooperative learning, traditional lecture, radiology teaching, medical undergraduate

### INTRODUCTION

As a new medical school, radiology teaching of undergraduate medical students in Universiti Sultan Zainal Abidin (UniSZA) was mainly in a traditional lecture (TL) method. Informal cooperative learning (ICL) which is one of the active learning teaching methods had been introduced in multiple radiology classes. Cooperative learning is one of the magnificent success stories in the history of educational research<sup>1-4</sup>. However in radiology, there are still remains a dearth of empirical research in medical education<sup>5</sup>. Given the overwhelming published benefit of cooperative learning, this is the time to explore the benefits of cooperative learning in radiology course in the undergraduate medical curriculum at UniSZA. It is important for lecturers who are involved in this teaching technique as well as faculty academic development unit to have a feedback from students regarding their attitude and preferences towards both TL and ICL. The results of this study will provide evidence to support either TL or ICL is a more suitable teaching method to be implemented in radiology teaching for undergraduate medical students.

Traditional lecture consist primarily of oral presentations, students listen and taking notes with minimal interruptions. TL composed of material to which student may or may not have access, allow instructor to transmit a large amount of factual knowledge in a short time, rarely interactive, often occur as monologues covering abstract material and give an overview of an upcoming topic. Medical education involves large amount of material to be covered during individual session. For this reason proponents of traditional lectures argue that, lectures allow the lecturer to efficiently transfer content to learners<sup>6</sup>. The alternatives to traditional lecture are active learning approaches and one of them is cooperative learning.

There are three commonly recognized types of cooperative learning groups, namely cooperative base groups, formal cooperative learning and informal cooperative learning (ICL). In ICL a temporary, ad hoc group is formed that last for a few minutes, one discussion or class period. Two to five students are randomly chosen to form a group and will rotate on regular basis. The aims are to focus learners' attention on teaching material, create an expectation set and mood

conducive to learning, as well as organize the teaching material in advance<sup>7</sup>. Cooperative learning strategies used in conjunction with lectures provide an environment designed to keep students focused, attentive, and learning<sup>8</sup>.

Five key concepts distinguish Cooperative Learning (CL) from other forms of group work<sup>9-11</sup>.

These are:

- (1) *Positive interdependence* created through establishing group goals, group tasks, team roles, learning goals, or shared resources;
- (2) *Individual accountability* promoting personal responsibility through individual exams or self and peer assessment;
- (3) *Face-to-face interaction* among students and their peers;
- (4) *Interpersonal skills* such as decision-making, leadership, trust-building, communication, conflict management, perseverance, and seeking to understand are specifically taught and practiced in this setting; and
- (5) *Group processing* wherein group members reflect on the group skill process and make decisions about how effective they are working on one another.

Much of the research on comparison of cooperative learning and traditional lectures has focused on cognitive outcomes and whether or not these approaches have led to improvement in student learning and academic performance. An educational intervention may pose challenges not only for the students but faculty as well as they have been socialised in traditional system. It was noted that there were few studies which attempt to look at lectures as experienced by students<sup>12</sup>. A group of researchers suggested further educational research should be directed toward the factors associated with learner perceptions of teaching value and the effects of such perceptions on learning outcomes<sup>13</sup>. Students' preference and attitude are important to be assessed in classes particularly when a new teaching technique is planned to be introduced into the curriculum. The purpose of this study is to compare the outcomes of students' preference and attitude towards TL versus ICL.

## METHODOLOGY

### Study participants and study instruments

In UniSZA, radiology teachings were integrated in the other clinical courses throughout clinical years. This interventional study was carried out among 52 third year MBBS students in four major courses namely internal medicine, orthopaedic, obstetrics and gynaecology, and surgery. A small

group of 13 students were assigned randomly to undergo all the four courses at a different time. The study duration was from September 2013 to July 2014. There are all together 11 radiology topics involved in this study, in which four topics were in internal medicine, four topics in orthopaedic, one topic in obstetrics and gynaecology, and two topics in surgery courses. Each group of students underwent five or six topics conducted using TL and the remaining topics were delivered with ICL method. Before and after the teaching intervention, the students' knowledge and interpretation skill were examined using One Best Answer and Objective Structured Clinical Examination questions respectively to promote individual accountability. In view of inadequate facility and small tutorial room size for group discussion, both teaching methods were conducted in a fixed classroom seating except for cooperative learning jigsaw technique. During this ICL activity, the classes were conducted in class room with suitable table size and non-fixed seating which were suitable for group discussion.

In TL method, power points were used to deliver the teaching materials. The lecturers conducted the classes with minimal interaction with the students, and there is no discussion among the students during the classes. In ICL classes, the lecturers still used power points to convey the essential information but the slides were less and shorter duration. The exact duration for each topic was not fixed because of the difficulty level of each topic was different. Throughout the class and in between the subtopic, the cooperative learning activity were applied included note checking, guided reciprocal peer questioning, think-pair-share, closure review pairs and question and answer pairs. Two topics were conducted without any lecture, whereby cooperative learning jigsaw technique was applied and involved student's total active participation. Instructions to students were clearly stated on PowerPoint slide. The details of each technique as described below.

#### i. *Note checking*

Students were asked to write down notes from PowerPoint slides/lectures individually for one subtopic e.g. 7 - 10 minutes. Subsequently they compared their notes with a partner that sits beside them. In pairs, they summarize the most important information from the notes. They also need to identify any sticking points in the notes and clarify if possible.

#### ii. *Guided reciprocal peer questioning*

Students listen to the lecture. Eventually students work in groups of three or four and are provided with a set of generic question stems.

- How does ... relate to what I've learned before?
- What conclusion can I draw about ....?
- What is the difference between ...and....?
- What is the main idea of ....?
- Why is ... important?

Each student individually prepared two or three thought-provoking questions on the content presented in the lecture. The small groups comes together for peer questioning where group members take turns answering the questions they generated individually in a discussion. Following the small group discussion, the whole class discuss questions that were especially interesting or did not yield a satisfying answer in the small group discussion.

*iii. Think-pair-share*

A lecturer poses a question to the class and the students think about their response individually. Afterward the students pair with a partner to talk over their ideas. Finally, students share their ideas with the class.

*iv. Closure review pairs*

Assign pairs of students to make a list of major topics covered during the class session. Each pair took one topic at a time and write down the best answer on the following question:

- What is the topic and why is it important?
- What interests you most about the topic?

Lecturer monitored the class by randomly asked a student to explain the topic. At the same time the lecturer noted topics which were most difficult for students.

*v. Question and answer pairs.*

In between the subtopic, every student was asked to take a minute and came up with one question on radiograph, topic or concept. Thereafter, the students were asked to turn to a partner and see if their partner can answer their question. Ultimately, the questions that have unsatisfactory or uncertain answers were discussed with the whole class.

*vi. Jigsaw activity*

No lecture involved in this activity. Students were provided with main textbook and printed material from traditional lecture PowerPoint slides. The students were divided into 4 sections to form expert groups and each group discussed a different subtopic using the jigsaw technique. The expert group gathered information, discussed and taught among each other using the provided teaching materials.

Subsequently, each member from the expert groups was reassigned to a jigsaw group so that each new member group was composed of four students from four different expert groups. Every student took turns to share and teach the other jigsaw members on the assigned expert subtopic. Lecturer present throughout the activity to guide their discussion and clarified any ambiguity or misunderstanding with the entire class.

There were three set of self-administered questionnaires that the students voluntarily answered after completed all four courses. The questionnaires were focused on:

- i. Students' attitude towards ICL.
- ii. Students' attitude towards TL.
- iii. Student's preference towards ICL and TL.

The questionnaires on students' attitude towards both ICL and TL comprised of six domains with 23 questions in total. Five-level Likert scale was applied to each item in these two former questionnaires in the following fashion: 5 scores were given for "strongly agree" and 1 score for "strongly disagree" in each positive statement whereas the reverse score ratings were given in each negative statement. A separated questionnaire on students' preference towards the two different teaching methods consisted of 18 items.

These questionnaires had undergone validation process and revealed excellent internal consistency with Cronbach's Alpha of 0.90, 0.92 and 0.88 respectively. Content validity was ensured by taking suggestions from the experts, and the questionnaires were corrected according to their suggestions. Prior to the study, all students were explained in details on the full description of the research, confidentiality and voluntary participation.

**Data Analysis and statistical application**

All data were analysed using Statistical Package for the Social Sciences (SPSS) version 22. Descriptive statistics was applied such as frequency (%) for categorical data, and mean (SD) for numerical data. Paired t-test was applied to compare the total mean scores between students' attitude on these two teaching techniques. Pearson's chi-square goodness-of-fit test was applied to determine whether there was equal distribution of students' preference for each statement in the preference survey. Level of significance ( $\alpha$ ) was set as  $< 0.05$  for this study. The study protocol was approved by University Human Research Ethics (UHREC), UniSZA: UniSZA.N/1/TD2/628-1 Jld.2 (19).

**RESULTS**

There were an overall 12 (23.1%) male and 40 (76.9%) female third year MBBS students involved in the study. The students had

significantly higher attitude scores towards ICL compared to TL method ( $p$  value = 0.012) (Table 1).

**Table 1 Mean total scores of attitude towards two different teaching methods (n= 52)**

Variables	Mean (SD)	Mean difference (95% CI)	$t$ statistic (df)	$P$ value*
Informal Cooperative Learning	90.90 (11.73)	5.44 (1.24, 9.64)	2.605 (51)	0.012
Traditional Lecture	85.46 (11.82)			

\*Paired  $t$ -test

Regarding the specific items of attitude in the six domains, between ICL and TL, students favoured ICL compared to TL in the following items in group dynamic domain:

- a) The teaching approach has improved my communication skills. ( $p = 0.031$ )
- b) The teaching approach helped me to acquire knowledge through working in a team. ( $p = 0.030$ )
- c) Students significantly disagreed that TL teaching approach gave them an opportunity to help others in the groups understand difficult material ( $p = 0.011$ ) compared to ICL teaching approach.

Out of 18 questions in the preference survey, the students significantly preferred ICL compared to TL in six items as shown in Table 2. Although insignificant, the rest of the items also favoured ICL except items 3, 9 and 16.

**DISCUSSION**

In the assessment of students attitude, there are six domains investigated which are students' engagement, participants in the class, future value of the teaching sessions, achievement of the topic objectives, group dynamic and learning process. The overall mean total attitude scores towards ICL are higher than TL ( $P$  value 0.012). This study is replicated the finding of previous similar studies. ICL enhances student learning and engagement. Students greatly valued opportunities for cooperative learning and active engagement in lectures, both as a means of improving their understanding of the unit content and in maintaining their interest during the

sessions<sup>14-15</sup>. Cooperative learning could address the desired outcomes in both content assimilation and development of interpersonal skills for medical students in their transition journey from being students to practicing physicians<sup>16-18</sup>. Students in cooperative environments developed more positive attitudes towards mathematics than students in traditional environments<sup>19</sup>. Few other researchers advocated cooperative learning not only for the positive effect it has on student performance but also for the positive effect it has on motivation, classroom socialization, the student's confidence in learning, and attitude toward the subject being learned<sup>20-22</sup>. In addition, cooperative learning also helped students become more aware of their own knowledge (metacognition) and improved relationships among students, self-esteem, social skills, and attitudes toward the course. The findings suggest that students believe that ICL facilitates engagement with teaching material, good working relationships among students, and enhances learning process.

Three specific items on attitude in the six domains, ICL had been favoured by students compared to TL in the following items in group dynamic domain. ICL has improved students communication skills ( $p = 0.031$ ) and helped students to acquire knowledge through working in a team ( $p = 0.030$ ). Moreover, students significantly disagreed that TL teaching approach gave them an opportunity to help others in the groups understand difficult material ( $p = 0.011$ ). The group learning environment in cooperative learning allows students to benefit from working in conjunction with more capable peers while those more capable students also benefit from the interaction with less capable peers<sup>23</sup>. ICL is able to improve on student's level of participation and working in group in the class activities<sup>24</sup>. Students agreed ICL technique, improved their communication skills, which can be applied beyond anatomy laboratory subject to their careers as future physician<sup>25</sup>.

**Table 2 Students' preference regarding two different teaching methods (n= 52)**

Student preference	Informal Cooperative Learning	Traditional Lecture	P value*
	Frequency (%)	Frequency (%)	
1. helps students learn new things easily	30 (57.7)	22 (42.3)	0.267
2. makes students feel intellectually challenged through the lecture	31 (59.6)	21 (40.4)	0.166
3. gives factual knowledge to the students	20 (38.5)	32 (61.5)	0.096
4. improves long term retention of the knowledge	27 (51.9)	25 (48.1)	0.782
5. aids the students better prepared for examinations	28 (53.8)	24 (46.2)	0.579
6. makes students feel actively involved in all activities through this approach	41 (78.8)	11 (21.2)	<0.001
7. creates a good rapport among group members	43 (82.7)	9 (17.3)	<0.001
8. gives student an opportunity to help others in the groups understand difficult material.	37 (71.2)	15 (28.8)	0.002
9. reaches its scope and meets the learning objectives	25 (48.1)	27 (51.9)	0.782
10. improves communication skills	39 (75.0)	13 (25.0)	<0.001
11. trains me how to be a good leader and a good follower	40 (76.9)	12 (23.1)	<0.001
12. enables student to participate in sharing information, making decisions, and solving problems	34 (65.4)	18 (34.6)	0.027
13. attracts student's interest in the subject	27 (51.9)	25 (48.1)	0.782
14. augments student's independent learning abilities	29 (55.8)	23 (44.2)	0.405
15. enhances clinical reasoning abilities	29 (55.8)	23 (44.2)	0.405
16. increases student's analytical skills	25 (48.1)	27 (51.9)	0.782
17. I have found the _____ method a good way to learn.	31 (59.6)	21 (40.4)	0.166
18. I think the module should continue in _____format.	31 (59.6)	21 (40.4)	0.166

\*Pearson's chi-square goodness-of-fit test

Statistically significant differences are evident, whereby students prefer ICL more than TL in the following items: ICL makes students felt actively involved in all activities through this approach, creates a good rapport among group members, gives an opportunity to help others in the group, understand difficult material, improves communication skills, trains student how to be a good leader and a good follower and enables student to participate in sharing information, making decisions, and solving problems. Even though more students found the ICL method is a good way to learn and they think the module should be continued in this active learning format but the differences is not statistically significant. These findings are consistent with previous studies which had found cooperative learning methodology encourages students to work in small heterogeneous group and to assist each other to attain mastery rather than the establishment of

competition environments of winners and losers<sup>23-24</sup>. In addition, a study in Industrial-sized Biology Classes found that students viewed cooperative learning activities favourably, raising the possibility that this approach might improve student engagement<sup>26</sup>. These findings suggest that encouraging students to work in small groups and improving feedback between the instructor and the students can help to improve student outcomes even in very large enrolment classes. Clearly, lecture activities need to be thoughtfully designed and carefully implemented if their potential for student learning and motivation is to be fully realised.

Students preferred ICL in all of the items except for three items: teaching technique which gives factual knowledge to the students, reaches the scope and meets the learning objectives, and increases student's analytical skills, however the mean differences are not statistically significant (P value >0.05) between these two teaching methods. These may be due to multiple factors which were highlighted by several authors. Some of the reasons for preferences for TL were students fear, apprehension, and past experiences which made them many preferred to work on their own rather than within a group<sup>27</sup>.

Over recent years there had not been an increasing trend in the percentage of students preferring non-traditional approaches for instruction<sup>28</sup>, however a greater percentage of students preferring non-traditional overall. The term "non-traditional teaching style" in that study was very generic and encompasses Distance Learning and Internet Based classes, Discussion Based and Activity Based including cooperative learning methods. We hypothesise that ICL is not fully accepted by all students most likely due to they had never been exposed to cooperative learning before. ICL is less favoured by the students in terms of reaches the scope and meets the learning objectives. Traditional lectures are more organised as a majority of lecturers will outline the scope and mention the learning outcomes at the beginning of the class before proceeding to the actual teaching contents. Paul et al. advocated that the active session learners had lower perceptions of both the session's value and its ability to meet learning objectives even though they achieved the same knowledge and attitudinal gains<sup>13</sup>. An alternate hypothesis for the lower perceptions of value among learners in the active group has to do with the structure of the active learning session itself. During this session, the lecturers quickly assigned learners (randomly) to small groups and immediately gave these groups a task to solve. The learners in the active group may have been reacting to their situation of having to work with strangers in intimate groups to achieve complex learning goals in a short amount of time. Educators have noted the importance of time, repeated contact, and familiarity among members of small groups (none of which were present in the active session) in order for the group process to be effective<sup>29</sup>.

Students preferred TL instead of ICL as a teaching technique because TL gives factual knowledge to them. In ICL, students are being exposed to the factual knowledge throughout the activities either in the small group or whole class discussion. As contrast to the TL, every single factual knowledge had been highlighted clearly

by lecturers. Another factor which contributed to the less favour of ICL is probably due to the reduction of contact time with the 'expert' and this might lead to lower learner perceptions of the value of the session in providing the factual knowledge to them.

Students in the cooperative class not only performed better in testing of knowledge and critical thinking and problem solving tasks<sup>30</sup>, ICL increase student's analytical skill as students did most of the learning either by themselves or in group. Lecturers will be the guide towards the solution of problem or topic discussion. However an interesting finding in this study showed that students felt ICL reduced their analytical skills. Since the culture of medical education has traditionally emphasized the value and legitimacy of traditional lectures over other methods of instruction, we hypothesize that when learners found themselves in a situation where the methods were unusual (i.e., the small-group/large group format of the active session), these methods were marginalized and the session was seen as less useful and lack in analytical skills engagement.

This study concluded that cooperative learning can be effective tool in the setting of the radiology teaching. Positive response from radiology residents indicated enjoyment working with their group and would like to participate in more cooperative learning activities was consistent with other study<sup>31</sup>. More directed involvement with the students enabled us to identify students with learning difficulties early in the course and help them. We also could address students' errors during class time, rather than waiting for a test to demonstrate their misunderstanding of course content. Students become more active to ask questions in the classroom and immediate clarification were made and benefit the whole class. Face-to-face interaction, individual and group accountability, positive interdependence, interpersonal skill and group processing elements implemented in the cooperative learning classes. Weaker students gain new skills and confidence, and everyone makes new personal connection. The process of thinking things through critically and learning how to work together and build consensus in a way that is respectful and professional are essential in the preparation of health professional.

Students were more positive about their learning experience with ICL. However this study has its limitation as it was conducted in one institution and only involved year three students with small sample size. Hence it is not possible to generalise the findings. Furthermore, the class size was

small maximum of 15 students per class therefore one lecturer able to conduct the activity alone. A study with bigger class size should be conducted.

### CONCLUSION

In conclusion, the attitude scores were significantly higher towards ICL as compared to TL. ICL was significantly preferred by students in six domains which include active involvement in the class, promotion of good rapport among classmates, facilitation of understanding and opportunity to help others understand difficult materials, improvement of communication skills, opportunity for training to be a good leader and

follower, and enabling to participate in sharing information, making decision and problem solving. We believed ICL method is recommended in radiology teaching because students demonstrated better engagement and participation in learning session as compared with TL.

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