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Abstract

Recognising the potential of Jigsaw Learning Method (JLM) and limited research around its uses in higher education, this case study sought to explore the perceptions of sport science students' on learning using the JLM. A total of 36 undergraduate students enrolling in the Sport and Exercise Psychology Course participated in this study. They were divided into groups and participated in JLM using a 2-hour lecture on 'addictive and unhealthy behaviours' with JLM materials uploaded into the Google Classroom. At the end of the JLM session, a reflective essay was carried out to find out students' learning experience. The analysis of the perceptions of the students on JLM revealed two main themes which were 'learning experience of JLM' and 'perceptions of their own and others' abilities'. JLM is perceived as an effective learning strategy but students were concerned on the issue of deliverable content and accuracy of the team members' responses. In this study, with its limitation, JLM proved that classroom learning could be educational and enriching.

***Keywords**: Active learning, cooperative learning, jigsaw learning, peer-assisted learning, group work, individualistic learning, sport science.*

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INTRODUCTION

Teaching and learning processes are always related to grades achieved by students and because of this numerous teaching method such as teacher-centred approach and student-centred approach are employed. The most common teaching methods such as lectures and direct instruction are considered among the popular teacher-centred approaches accepted globally (Harman & Nguyen, 2010) including its application at universities. However, the experts concur this method is not suitable for long-term learning (Kaur, 2011). According to Hadibarata and Rubiyatno (2019), current teaching approach at the institution of higher learning is very dependent on conventional methods, and consequently the teaching of undergraduate courses did not facilitate students' full participation and contribution during the learning process. Hence, there is a necessity to review teaching methods for undergraduates in order to achieve high levels of learning goals (Bradshaw & Hultquist, 2017).

There are studies (Kouti, Aghsam, Bargard, Javadi, Aghakouchakzadeh, & Eslami, 2018) that have reported better learning outcomes for other methods (eg. active learning, blended, e-learning) compared to traditional lectures. However, other studies (eg. Hafezimoghadam, Farahmand, Farsi, Zare, & Abbasi, 2013) revealed no significant differences in learning outcomes between other teaching methods and lecture methods. In fact, other studies reported students and teachers were not supportive of active learning based on numerous reasons. Students' complaints about active learning and prefer traditional methods (Henderson, Dancy, & Niewiadomska-Bugaj, 2012). They dislike having to take more responsibility to learn or increase cognitive effort (Deslauriers et al., 2019). Similarly, teachers persist with using traditional methods cited numerous reasons such as insufficient teaching time (Goffe & Kauper, 2014), inadequate time to cover subject's content (Hayward, Kogan, & Laursen, 2016), concerns about implement teaching assessment (Henderson, Khan & Dancy, 2018), having limited resources (Hayward, Kogan, & Laursen, 2016; Patrick, Howell, & Wischusen, 2016), and lack of departmental support (Henderson, Beach, & Finkelstein, 2011).

In view of the inconclusive evidence, various other teaching methods can be used to examine a specific student group. One popular method is the active learning approach where

teaching strives to involve students in the learning process more directly than in other methods; students are engaged in performing learning tasks and thinking about the task they are involved in. Based on Vygotsky's sociocultural learning and social constructivism theories (Vygotsky, 1978), active or interactive teaching methods are effective based on interaction among people who form groups to learn (Slavin, 2014); group interaction allowed information to be integrated at individual level (Shaffer, 2008). Moreover, the construction of knowledge in active learning allows participants to understand the learning situations and internalize their experience (Sessoms, 2008). In addition, it promotes a sense of togetherness among participants (Sharpton, Yu, & Shoair, 2019).

Active learning in the form of cooperative learning (CL) has been applied in the classroom settings all over the world. CL is a student-centered learning method that allows students to collaborate and interact in small groups (Kamaruddin & Yusoff, 2019). According to Bodsworth and Goodyear, CL has become an increasingly used pedagogical model in education since 2006 due to highly publicised CL experiences, and the availability of its resources (Chen & Liu, 2017). CL has been reported to help teachers transform their classroom and make learning more appealing to students (Zhang, Peng & Sun, 2017). In addition, Buchs and Butera (2015) opined that the implementation of CL requires only short-term investment by teachers in terms of time and resources.

Moreover, CL involved students in a group work setting, focussing to achieve a shared target, thus adding value to the success of the group. CL helps students in numerous ways such as improving self-concept, and self-confidence (Zakaria, Solffitri, Daud & Abidin 2013), uplifting self-esteem and cohesiveness (Sahin, 2011), consequently polishing social skills and increased classroom participation. In addition, many researchers (Casey, 2013; Goodyear, Casey, & Kirk, 2014) reported that group interactions promote listening to one another, constructing understanding together, respecting each other and encouraging each other to learn, as well as promoting a sense of togetherness among students and teachers (Sharpton et al., 2019).

Among CL methods that have become popular is the Jigsaw Learning Method (JLM). JLM is a form of cooperative learning, in which students are actively involved in the teaching-learning process (Haghani, Rahimi, & Ehsanpour, 2014); students teach part of the regular curriculum to a small group of interdependent peers (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978). Students in a group would master each topic assigned and are responsible to teach other group members according to their understanding. This partnership would encourage interaction and enhance the social skills of students within and between groups. Previous research revealed that JLM was successful because it focuses on task specialisation and individual reward (Nastasi & Clements, 1991). Current studies supported JLM as it significantly promotes interests among students to engage in social and group interactions (Diyazid, Osman & Sabil, 2017). Similarly, Casey and Goodyear (2015) supported JLM because it enhances cognitive learning; recalling knowledge and developing intellectual skills such as critical thinking and problem solving.

In Malaysia, the examination of JLM and its effects on students' achievement and outcomes has been confirmed through 14 studies. To date, there have been only 8 published studies reporting on various aspects of JLM involving undergraduates. Chua and Balasundaram (2018) reported JLM promoted a positive attitude towards learning. Hadibarata and Rubiyatno (2019), Nendi (2018), and Norintan (2008) investigated the effects of JLM among engineering and dentistry undergraduates and revealed that JLM enhances understanding of course materials, concepts and better retention of information learned. Other researchers revealed better academic achievement among undergraduates using JLM in the field of accountancy (Mohidin, Jaidi, Lim, & Osman, 2009), in science (Yeoh, 2013), in hospitality (Khalil, Tajudin, Tajuddin, Mamat, & Hadi, 2014), and in engineering (Hadibarata & Rubiyatno, 2019; Nendi, 2018). However, there is no study so far on JLM relating to sport science. Thus, this case study is imperative to provide information on the implementation of JLM and students' response of the method especially among sport science students.

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METHOD

Research design

A case study research design (O'leary, Barber & Keane, 2018) was adopted to fulfil the objectives of this study; to examine the process of learning and the product of learning (Stake, 1995). This case study was particularly useful to explain, describe the phenomenon in the real-life contexts (Crowe et al., 2011).

Subjects

A total of 36 undergraduates who were enrolled in the BASE2114 Sport and Exercise Psychology course participated in this Jigsaw study method. They participated in the study method during their 2-hour lecture on *'addictive and unhealthy behaviours'.*

Jigsaw Method and Procedures

Planning

This Jigsaw Learning Method (JLM) was applied to the undergraduate course BASE2114 Sport and Exercise Psychology. The topic *'Addictive and unhealthy behaviours'* was one of the 8 topics taught for the semester to year two Bachelor in Sports and Exercise Science students.

Determining behavioural objective

The objective of this study was to determine the understanding of 'addictive and unhealthy behaviours' of adults.

Preparation of the materials/resources

The lecturer of the course searched on-line resources and identified six topics related to '*Addictive and unhealthy behaviours'* which included subtopics of unhealthy weight-control and dieting behaviours, physical activities among undergraduates, negative addiction to exercise, drug abuse among athletes, gambling among college students, and eating disorders among athletes. The content of each of the six topics consisted of the Abstract and the Introduction/Literature sections, selected from each article.

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The materials were then uploaded into the Google Classroom and students were asked to access them using their hand phones. In addition, the lecturer also prepared a total of 15 MCQ with 3 options to test the students' understanding at the end of the lesson.

Briefing and grouping students before the start of the JLM

The participants were the undergraduates who attended the BASE2114 Sport and Exercise Psychology 2-hour lecture class. The students were briefed about the Jigsaw Learning Method (JLM) to be familiarized with the benefits of the method. Then, they were briefed about the 6 topics to be used, and the 4 implementation phases to be applied. After that, the students were divided into 6 groups, with 6 members in each group to correspond to the 6 topics. Students were allowed to choose their own group members when forming the groups. Figure 1 showed the formation of the jigsaw groups and the phases of learning that were involved.

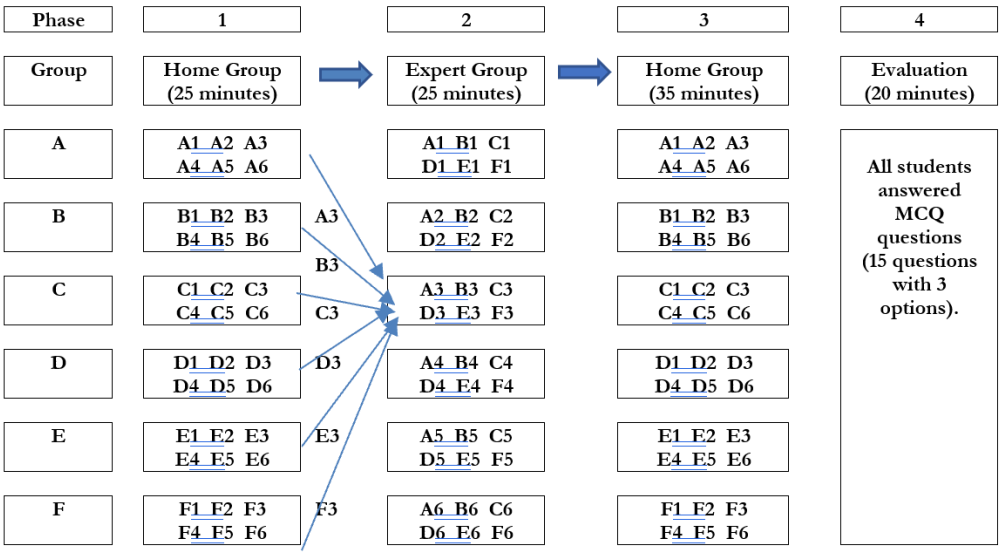

Figure 1. Jigsaw Method – Home Group and Expert Group formation according to phases.

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THE FOUR JLM PHASES ARE DESCRIBED BELOW:

Phase 1: Home Group [HG] (25 minutes)

The 6 Home Groups (HG) were separated and placed in a circular formation. The groups were given the same content based on the 6 topics. Each group appointed a leader, then the leader assigned each member a subtopic from the 6 topics provided by the lecturer. Each member downloaded the material from the Google Classroom and read the assigned subtopic from his/her hand phone. The lecturer kept the time for Phase 1.

After the duration, the lecturer would signal for students to move to Jigsaw Expert Group (JEG). A member for a subtopic would move to a designated JEG based on the 6 topics, upon receiving a signal from the lecturer.

Phase 2: Jigsaw Expert Group [JEG] (20 minutes)

Members of JEG consisted of members of different home groups that have the same subtopic. The JEG members would then communicate, share and discuss each topic within each JEG. This phase would allow each member to learn from each other, to confirm the facts relating to the subtopic and master the topic before going back to the HG to teach his/her group members. The lecturer kept the time for Phase 2, and mobilized the members back to their HG. The students then moved back to HG upon receiving a signal from the lecturer.

Phase 3: Home Group (35 minutes)

The students returned to their HG again to present their subtopic to other group members. The group leader would monitor the time for each member to share the content of each subtopic. All the group members for the 6 HG would then be briefed on the content of the 6 subtopics. Each member took turns to provide a summary of the key points related to his/her subtopics to other team members. Subsequently, the lecturer would signal the students to stop and get ready for a test.

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Phase 4: Evaluation (20 minutes)

The lecturer tested all students to ensure learning by using MCQ test which consisted of 15 questions with 3 options each. The questions were based on the 6 subtopics that they had learnt. The questions were projected on the screen one question at a time, and students were given a few minutes for each question to jot down their answer. Subsequently, the lecturer assessed the students' performance in terms of the number of questions answered correctly.

Finally, the lecturer requested the students to provide their opinions on the JLM. They were asked to provide positive and negative opinions about JLM; the opinions were written by students individually and submitted to the lecturer.

RESULTS

Based on the reflective essay written by all the students at the end of the class, percentages were calculated. The analyses were tabulated in the two tables below.

Table 1: *Students' perception of learning experience of JLM*

Statement	Percentage
The activity promoted interactions/socialization among friends.	28.1
This was an effective way of learning.	18.8
The activity was enjoyable/interesting/fun.	18.8
The activity helped in enhancing communication skills.	15.6
The activity enabled better understanding of learning materials.	12.5
Confident when presenting material or speaking out.	6.3

Note: The sum of the percentages is higher than 100% as students reported many responses.

Table 1 revealed supportive attitude of students on JLM. Students accepted JLM as an effective learning method which promotes better understanding of learning materials. They viewed JLM as enjoyable way of learning sport science materials. In addition, they agreed that JLM provided opportunities for them to interact with other students which helped them improve their communication skills and enhance their confidence.

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In Table 2, students perceived their own abilities and other course mates' abilities as the obstacles to learning. Often, course mates were not able to understand the content thoroughly and lacked the capability to impart accurate and adequate content. Coupled with the lack of time, some contents were not delivered by group members to the group.

Table 2*: Students' perceptions of their own and others' abilities*

Perceptions	Percentage
Points delivered by other group members were unclear and incorrect.	28.1
Others lack the capability to read, to understand and to explain.	28.1
Lack of time hampered understanding of content, memorizing the content, and delivering the content.	21.8
Some information might be missed or not provided by group members.	15.6
This method was too complicated.	3.1
Other group members did not put in enough effort into the activity.	3.1
Lack confident to present due to the lack of cooperation from others.	3.1

Note: The sum of the percentages is higher than 100% as students reported many responses.

Students' Reflection

Numerous emotions were detected from students' reflection but two main emotions prevailed: a supportive attitude, and feelings of self-doubt and lack of ability to engage in the activity.

The following code indicates which citation belongs to which student: The students were coded as first student (S1), second student (S2), third student (S3), and so forth. Theme codes were coded as A and B.

Thus, Student 1 for theme A is S1A and Student 1 for theme B is S1B, and so forth.

The perceptions of students are presented in detail below:

Almost 20-30 percent (Table 1) of the students expressed enjoyment and interest in the JLM. The JLM is novel to the students. It is fun, refreshing, stimulating, and enriching.

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> "I feel that this a fresh and new type of learning which could involve everyone in the group…. provide a fun learning experience. It helps us to understand and pay attention to friend's topics. Sharing time should be extended". (Student A4)

> "Quick learning method…save time. Shared knowledge…improve message delivery verbally…develop communication skills". (Student A2)

> "Based on my opinion, this method allows us to be more participative during the discussion period and to improve our skill of transferring message to others". (Student A27)

However, some students expressed their dissatisfaction with JLM. The method seemed to post difficulties to the students based on two main factors such as the novelty/complexity of the activity and time constraint.

> "I think this method is too complicated…should find other method…Maybe, it's not my style of learning". (Student A1)

> In my opinion, this method is not suitable for my learning process…as I am a slow learner and I prefer to study myself. Although it is good to have discussion among each other, I still afraid to ask too many questions. (Student A30)

> "Lack of time to read…lack of time to understand…lack of time to explain". (Student B2)

From their reflection, students revealed the benefits of JLM through peer teaching and group discussion. The activity promotes confidence in communication and acceptance of team members. Three students specifically stated that the experience improved their soft skills, encouraged them to share ideas and learned to accept ideas from others. They felt that small group discussion helped in confirming the reading content.

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> "In my opinion this is a new method of learning where we are able to teach each other. It's good to enhance everyone's teaching skill and learning ability". (Student A22)

> "A good method to teach others. It's good to listen to others perspective and compare it to yours". (Student A29)

> "Fast work. Understand easily the topic…understand and confirm the content when discussing with the other group member". (Student A28)

Almost 19 students were doubtful and uncertain about the quality and quantity of the content delivered by their group members. As such a student revealed that he still preferred the lecture method through an instructor. Others felt that the quality of group members is questionable; their understanding of the content and their presentation ability. Majority of the students were worried whether the information they received from group members were sufficient enough to prepare them for the quiz at the end of the lesson. A student even questioned the adequacy of the efforts of group members in contributing to the success of the activity.

> "Points delivers (by other students) are not clear..." (Student B1)

> "… Don't know whether others got put full effort or not, may be my friend did not present everything the article have". (Student B3)

> "Yet, there are many disadvantages which are, friends cannot fully explain, cannot fully understand and friend give wrong answer". (Student B10)
>
> "There are some vital points that our friends might missed out". (Student B6)

> "Members might miss important information. Members with poor explanation skill can't deliver the message effectively". (Student B20)

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DISCUSSION

The purpose of this paper was to share the application of JLM in the sport science setting and convey the experiences of the students. However, there was no intention to make a comparison between JLM and other teaching methods. It is hoped that by sharing the outcomes of this case study, educators could weigh the benefits and the limitations of JLM, and make appropriate adjustments to suit his/her students' needs.

Students' resentment of JLM

The results of this study showed that some students were not supportive of JLM. In terms of their background, Sport Science students in this study were exposed regularly to lecture or teacher-centred methods where their involvements were limited and passively received information from their lecturer. Thus, they were uncomfortable with the new teaching and learning method.

The dissatisfaction of JLM and the preference for traditional lecture methods was also reported in other studies (Henderson, Dancy, & Niewiadomska-Bugaj, 2012; Levya-Moral & Camps, 2016; Persky & Pollack, 2009). Students dislike being forced to interact with one another during group learning (Vuorela & Nummenmaa, 2004), and dislike having to take more responsibility to learn or increase cognitive effort (Deslauriers et al., 2019). In fact, in a study by Persky and Pollack (2009), almost 55% of the participants felt that they learnt less using JLM. Similarly, in a study of Jamaican students by McLeish (2009), it was revealed that 50% of the respondents felt uncomfortable in CL classes. The study reported that learners preferred to work alone than in a group due to the fear that they would achieve low grades and to avoid the conflicts of interest. Moreover, Buchs, Filippou, Pulfrey and Volpe (2017) reported that some studies related to Physical Education had shown initial rejection when CL was introduced in their classes. The change in the instructional approach was not easily acceptable as the students were used to a teacher centred approach, where group work was not relevant (Howard, 2015).

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Benefits of JLM

The findings of this study revealed that JLM promotes confidence in communication and enhances students' teaching skill and learning ability. The group activity allows them to teach each other, to confirm content and encourage them to share ideas and learn to accept ideas from others, as well as provide relevant support to friends and create teamwork.

The activity promoted interactions/socialization among friends.

Analysis of students' perception of this study revealed that the most frequent response of students (28.1%) highlighted that JLM promoted interactions/socialization among them.

The findings of this study are confirmed by previous researchers (Casey & Goodyear, 2015; Dyson, Colby & Barratt, 2016) that positive interdependence occurs where all group members contribute and depend on one another to achieve the same goal. Similarly, those researchers also support the enhancement of interpersonal and small group skills during the activity where participants listen actively, giving and receiving feedback, or praising others' efforts, and JLM encourages group processing where group activity provides a platform for participants to discuss and reflect on the content. Similarly, Baloche and Brody (2017) further emphasized that CL has promoted among others, positively students' achievement, motivation for learning, and intergroup relations.

The activity enhanced communication skills and enabled better understanding of learning materials.

Based on the findings reported in Table 1, it was reported by students (15.6%) that JLM enhanced communication skills, and students (12.5%) also opined that JLM helped them understand class learning materials better.

The findings of this study are in line with Aydin and Biyikli (2017) research which found that jigsaw technique created an effective learning environment. The students were noted to express their ideas better as a result of a cooperative environment. In support of this, Bhandari, Mehta, Mavai, Singh, & Singhal (2017) also reported that jigsaw activity promoted better bonding among students. Jigsaw method helps in the development of scientific process

skills of learners. It was also found that learners' affective domain was also influenced by the jigsaw strategy (Karacop and Diken, 2017).

The findings were also supported by Nusrath et al. (2019) which 152 medical students' learning experience of JLM was examined and their perceptions towards the method was explored, found JLM useful in helping understanding of content (mean score = 4.18/5) and enhanced students communication skills (mean score = 4.59/5). In addition, 27% of the participants concurred that JLM helped them overcome shyness, hesitation and stage fear during the activity (mean score = 4.41/5).

The activity was enjoyable/interesting/fun and an effective way of learning

The findings of students' perception in Table 1 showed that students opined JLM was an effective learning strategy (18.8%) and JLM was enjoyable/interesting/fun (18.8%).

In the study by Nusrath et al. (2019) on 152 medical students, it was found that students enjoyed the activity of JLM (mean score = 4.31/5) and JLM was an effective way of learning (mean score = 4.01/5). JLM is considered effective because it is successful in producing a desired or intended result. JLM has shown to foster communication skills with a transition of students from passive learners to active learners (Phillips & Fusco, 2015). Consequently, students gained maximum knowledge on what they learned (Nusrath et al., 2019), and remembered the content longer because they enjoyed learning through JLM and the learning process was fun (Nusrath et al., 2019; Rao, 2016). Nusrath et al. (2019) also reported that some students enjoyed JLM because learning together with friends was more fun and achieving better understanding as their confidence level increased.

According to Rao (2016), enjoyment in learning increases the interest in learning a subject and improves scholastic performance. In Rao's study (2016) of school children, it was found that JLM has changed students' perception on difficult subjects such as mathematics; students perceived learning of mathematics as interesting and enjoyable, thus improved performance following JLM (Rao, 2016). On retention of content learnt through JLM, numerous studies have demonstrated higher knowledge retention in 3-4 weeks delayed post-

test scores in jigsaw group compared with traditional teaching (Kumar et al., 2017; Sagsoz, Karatas, Turel, Yildiz, & Kaya, 2017). Earlier Adams (2013) reported that through JLM students developed an interest in working with other students; students were able to answer the questions more confidently. In support of this, Garcia, Abrego, and Robert (2017) also found that JLM is an effective strategy allowing students to learn through cooperation instead of rote learning and isolation. Nusrath et al. (2019) confirmed those findings when her research revealed that 14% (n=20) of the participants (second highest response) had better understanding of the topic learnt.

Students' perceptions of their own and others' abilities

The findings of this study revealed among others four main perceptions on students' ability and ability of group members (Table 2). Twenty-eight percent of the students perceived that some group members lack the capability to read, to understand and to explain, and could not deliver content clearly and content delivered was incorrect. Almost 22% of the students opined that time constraint hampered understanding of content, memorizing the content, and delivering the content. About 16% of the students perceived that some group members might have missed out information from their reading or they failed to provide adequate information to group members.

On the issue of group members lacking the capability to read, to understand and to explain, Nusrath et al. (2019) reported that 7% of a sample of medical students (n=152) on JLM perceived that group members might not teach well due to language barrier. Consequently, this led to 7% of the students echoed their concern that the inadequacy of teaching from group members led to misunderstanding of the content and at times confusing. According to other researchers (Kumar et al., 2017; Persky & Pollack, 2009), the pitfall might be due to group members' low academic ability, which subsequently affected the success of the group. Nusrath et al. (2019) also documented other concerns of slow learners among group members; slow learners found it hard to learn the content swiftly, and could not cope with JLM.

Another concern of the students of this study was that delivery of content which the group members perceived that their team members could not deliver content clearly and

correctly. In a study of 66 third-year dentistry undergraduates, Norintan (2008) reported some students' concerns on the quality and quantity of the materials that they had received verbally from their group members. Three percent of the students were concerned whether the given information was sufficient for the end of class evaluation. In addition, Ghaith's study (2018) showed almost 44% of the respondents perceived that the implementation of JLM requires time, is demanding and needs discipline, thus some students may be demotivated to take their roles seriously.

CONCLUSION

The main contribution of the present study has been to examine the effects of JLM in the Sport Science setting. The perceptions of the students had highlighted the importance of JLM in Sport Science. JLM could enhance learning outcomes through the creation of an atmosphere of interaction, socialization and cooperation between the students to achieve a common goal. JLM was perceived by students as enjoyable, interesting, and fun which has helped improve students' attitude toward learning and motivate them to be active in the learning environment. JLM was considered effective by students because it enhanced their communication skills and enabled them to understand learning materials better and could retain the content better. In short, JLM was successful in producing a desired academic performance and in developing students' affective and cognitive domains. However, the issue of non-performing students and ways to monitor the adequacy of the content provided by the group members should be addressed in future research.

Disclosure statement

No potential conflict of interest was reported by the authors.

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