

Comparison between Jigsaw and Snowball Method of Active Learning among First Year Medical Undergraduates: An Interventional Study

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Abstract

Present study focuses on comparison between the efficacies of jigsaw and snowball methods active learning. An interventional study was conducted among first year medical undergraduates. Overall, 167 students studied by jigsaw method and 173 students studied by Snowball method. To study the preferences of students between Jigsaw and Snowball method a structured questionnaire using five point likert scale was used. Both the method significantly improved the knowledge of students. Overall response based on the questionnaire about jigsaw method was positive. Students found it to be simple, enjoyable and effective means of learning.

Keywords: *Self-directed learning, Jigsaw method, Snowball method, Physiology.*

Introduction

Self- directed learning is defined as “a process in which individuals take the initiative without the help of others in diagnosing their learning needs, formulating goals, identifying human and material resources and evaluating learning outcomes”¹. Freeman et al. (2014) described active learning where students use higher order thinking to complete activities or participate in discussion in class. There is a frequent link between active learning and working in groups.²

There is a paradigm shift in medical education due to implementation of new MCI curriculum³. This is a welcome change wherein teaching and learning has been shifted to student centred approach.

There are various method of active learning like Jigsaw method, snowball method, role playing, problem based learning. They too have some drawbacks like it needs active involvement of students, more faculty members are required.

Many studies have been conducted to compare the efficacy of didactic lectures and one of the active learning method. But there is lack of knowledge about comparison between two active learning method. Therefore present study focuses on comparison between the efficacies of the most commonly used active learning method i.e. jigsaw and snowball method. Present study also intends to have insight about the students’ preferences among two method.

Material and Method

An interventional study was conducted among first year medical undergraduates at SVNGMC, Yavatmal. Approval from the institutional ethics committee was sought.

For feasibility purpose, all the consenting first year students were included in the study. A sensitization session for faculty and students was taken about Jigsaw

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method and Snowball method. Two different topics were selected for active learning and two sessions of active self-directed learning were taken. The strength of First year MBBS students at our institution is 200. They were divided into two batches A (Roll no 1-100) and B (Roll no 101 -200). In first session, Batch A (88 students were present out of 100) was randomly selected for Jigsaw method and batch B (83 students were present out of 100) was selected for Snowball method. Physiology of Cell was taught to both the batches. An objective questionnaire containing ten questions was prepared and validated by assistance of other faculty members. Both the groups were given pre test and post test and same duration was given to answer the test. After the post test the topic was revised for entire batch together.

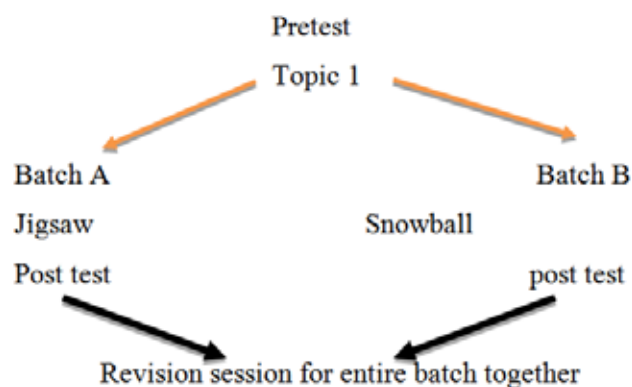
In second session Immunity was taught and the batches were exchanged, Batch A (90 students were present out of 100) was taught by Snowball method and batch B (79 students were present out of 100) was taught by Jigsaw method.

Same procedure was followed as the first session.

Overall including both the sessions 167 (88+79) students studied by jigsaw method and 173 (83+90) students studied by Snowball method.

To study the preferences of students between Jigsaw and Snowball method a structured questionnaire using five point likert scale was used.

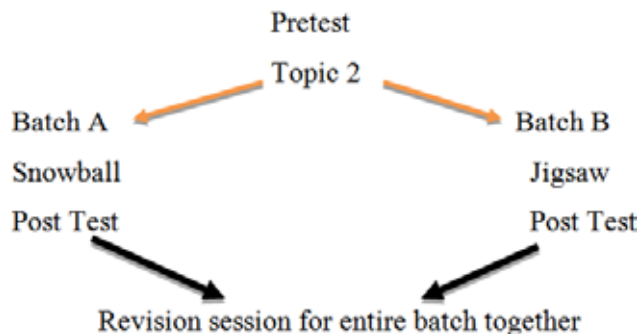
Session 1-Topic: Physiology of Cell



Feedback about jigsaw and snowball method regarding preference among the two method.



Session 2 - Immunity



Feedback about jigsaw and snowball method regarding preference among the two method

Study Statistics: Data was entered in Excel and analysed using statistical software Epi Info 7. Qualitative data was presented as numbers and percentages. Mean score with standard deviation of pre and post test was calculated. Student’s t test was used as test of significance for mean score of two groups. P value less than 0.05 was considered to be statistically significant.

Operational Definitions: Jigsaw method: Students are divided into subgroups that are subsequently split up to form new groups. The second groups are so formed that each group in the second configuration having one member from each of the first group. This helps to make the most of the crossing over of information.

Snowball method: First students are divided into pairs and one subtopic is given to them for discussion. Pairs join up to form fours and then next subtopic is given. Fours join to form eights and they together discuss next subtopic. Eights join to form sixteen and discuss next subtopic. Gradually more complicated topics are given as the groups gets larger.

Observation and Results

Table 1: Comparison between pre and post test mean score of Jigsaw method

| (n = 167) | Pre test | Post test | P value for t test |
|----------------------|------------|-----------|--------------------|
| Jigsaw Mean score±SD | 3.78 ±1.20 | 8.37±1.06 | <0.001 |

Table 1 shows comparison between pre and post test mean score of Jigsaw method. Pre test mean score + SD was 3.78 +1.20 which improved to 8.37 + 1.06 after the jigsaw session. There was a statistically significant difference in the mean scores (P <0.001).

Table 2: Comparison between pre test and post test mean score of snowball method

| (n = 173) | Pre test | Post test | P value for t test |
|------------------------------|-----------------|-----------------|--------------------|
| Snowball mean score \pm SD | 3.51 \pm 1.24 | 8.45 \pm 1.04 | <0.001 |

Table 2 depicts comparison between pre test and post test mean score of snowball method. Pre test mean score + SD was 3.51 + 1.24 whereas post test score was 8.45+ 1.04. There was a statistically significant difference in the mean scores (P <0.001)

Table 3: Comparison between Pre test mean scores of jigsaw and snowball method

| Method | Jigsaw (n = 167) | Snowball (n = 173) | P value for t test |
|------------------------------|------------------|--------------------|--------------------|
| Pre test mean score \pm SD | 3.78 \pm 1.20 | 3.51 \pm 1.24 | 0.67 |

Table 3 shows difference between pre test mean scores of both the method. There was no statistically significant difference in the score (P=0.67); thus both the groups were comparable at the start and had similar level of knowledge for the allotted topics.

Table 4: Comparison between Post test mean scores of jigsaw and snowball method

| Method | Jigsaw (n = 167) | Snowball (n = 173) | P value for t test |
|-------------------------------|------------------|--------------------|--------------------|
| Post test mean score \pm SD | 8.37 \pm 1.06 | 8.45 \pm 1.04 | 0.80 |

Table 4 shows difference between post test mean scores of both the method. There was no statistically significant difference in the score (P= 0.80); thus both the method were equally effective in covering the given topic and improving the knowledge of the students.

Table 5: Response of students for Jigsaw method using likert scale

| Sr. No. | Question | Strongly Disagree n (%) | Disagree n (%) | Can't Say n (%) | Agree n (%) | Strongly Agree n (%) |
|---------|--|-------------------------|----------------|-----------------|-------------|----------------------|
| 1 | This method of teaching and learning is simple | 10(5.99%) | 15(8.98) | 21(12.57) | 98(58.68) | 23(13.77) |
| 2 | This method is useful in comprehending the given topic. | 2(1.20) | 14(8.38) | 18(10.78) | 110(65.87) | 21(12.57) |
| 3 | This method enabled in-depth coverage of the topic | 18(10.78) | 54(32.34) | 36(21.56) | 41(24.55) | 17(10.18) |
| 4 | This method gives opportunity to clear doubts | 0 | 11(6.59) | 22(13.17) | 110(65.87) | 24(14.37) |
| 5 | This method helped in enhancing communication skills | 0 | 0 | 0 | 80(47.90) | 87(52.10) |
| 6 | There is equal opportunity for every student for discussion in this method | 0 | 0 | 4(2.40) | 93(55.69) | 70(41.92) |
| 7 | Useful method even if you attend the session unprepared. | 14(8.38) | 37(22.16) | 29(17.37) | 64(38.32) | 23(13.77) |
| 8 | This method of teaching and learning is enjoyable | 11(6.59) | 7(4.19) | 12(7.19) | 99(59.28) | 38(22.75) |
| 9 | Teachers play an important role in this method of teaching and learning | 1(0.60) | 35(20.96) | 28(16.77) | 66(39.52) | 37(22.16) |
| 10 | This method should be incorporated for all the topics in physiology. | 18(10.78) | 41(24.55) | 4(2.15) | 47(28.14) | 18(10.78) |

Table 5 shows response of students for Jigsaw method using likert scale. About three fourth of the students agreed and strongly agreed (72.45%) that this method is simple. Most of the students (81.44%) had opinion that method is useful in comprehending the given topic. There was mixed response about in-depth coverage of the topic. About one third students (34.73%) responded agree and strongly agreed. Whereas 43.12% students disagreed about in-depth coverage. Majority of the students (80.24%) agreed that method gives opportunity to clear doubts. All of them agreed that this method is useful in enhancing communication skills. Almost all

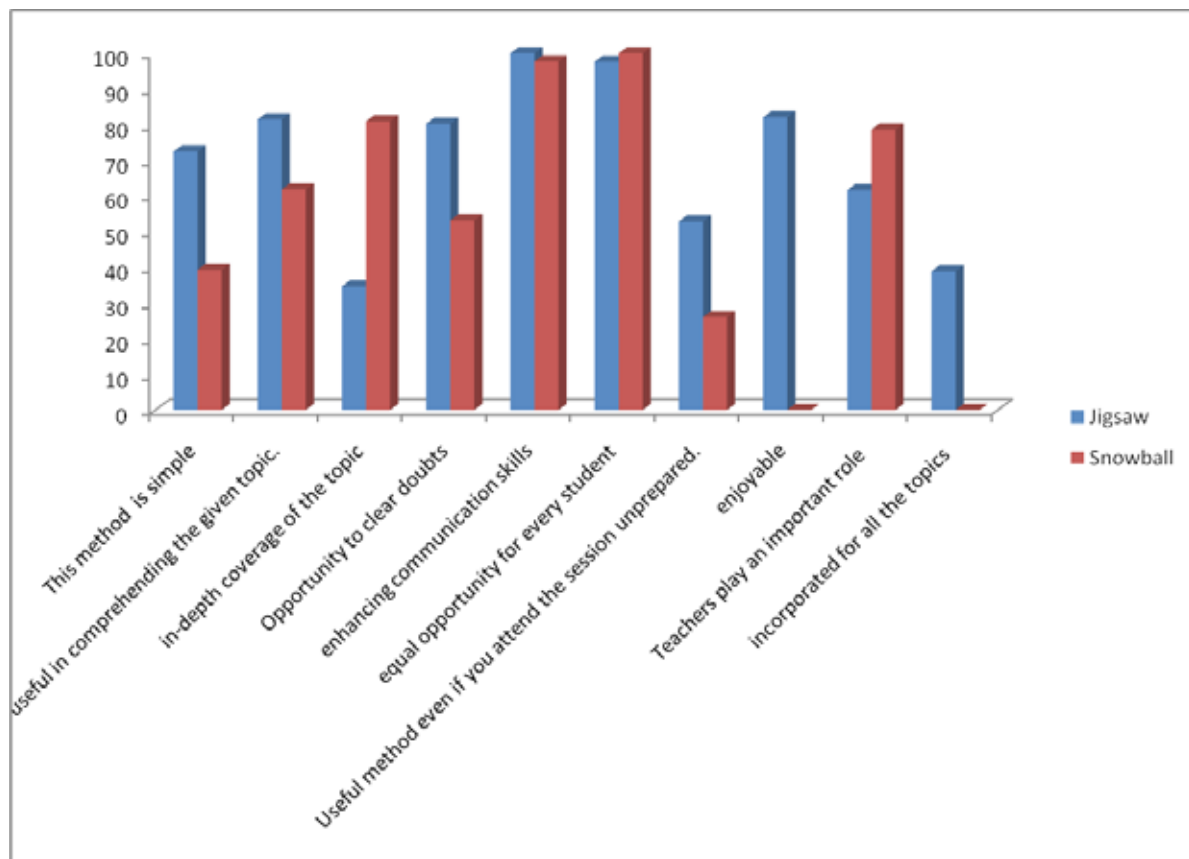
(97.61%) agreed that there is equal opportunity for every student for discussion in this method. About one third of the students disagreed that the method is useful if you attend unprepared for the topic, whereas more than half (52.90%) agreed that the method is useful if you attend unprepared for the topic. Majority of the students (82.03%) agreed that the method is enjoyable. More than half (61.68%) agreed that teachers play an important role. Only 38.92% agreed that this method should be incorporated for all the topics in physiology and similar proportion (35.33%) disagreed about it.

Table 6: Response of students for snowball method using likert scale

| Sr. No. | Question | Strongly disagree n (%) | Disagree n (%) | Can't Say n (%) | Agree n n (%) | Strongly Agree n (%) |
|---------|--|-------------------------|----------------|-----------------|---------------|----------------------|
| 1 | This method of teaching and learning is simple | 19(10.98) | 43(24.48) | 43(24.48) | 50(28.90) | 18(10.40) |
| 2 | This method is useful in comprehending the given topic. | 2(1.16) | 36(20.81) | 28(16.18) | 69(39.88) | 38(21.97) |
| 3 | This method enabled in-depth coverage of the topic | 11(6.36) | 10(5.78) | 12(6.94) | 102(58.96) | 38(21.97) |
| 4 | This method gives opportunity to clear doubts | 14(8.09) | 38(21.97) | 29(16.76) | 68(39.31) | 24(13.87) |
| 5 | This method helped in enhancing communication skills | 0 | 0 | 4(2.31) | 97(56.07) | 72(41.62) |
| 6 | There is equal opportunity for every student for discussion in this method | 0 | 0 | 0 | 84(48.55) | 89(51.45) |
| 7 | Useful method even if you attend the session unprepared. | 3(1.73) | 113(65.32) | 12(6.94) | 22(12.72) | 23(13.29) |
| 8 | This method of teaching and learning is enjoyable | 81(46.82) | 55(31.79) | 37(21.39) | 0 | 0 |
| 9 | Teachers play an important role in this method of teaching and learning | 3(1.73) | 15(8.67) | 19(10.98) | 115(66.47) | 21(12.14) |
| 10 | This method should be incorporated for all the topics in physiology. | 34(19.65) | 118(68.21) | 21(12.14) | 0 | 0 |

Table 6 describes the responses of students about snowball method on five point likert scale. About equal proportion of students disagreed (35.56%) and agreed (39.30%) that the method is simple, whereas 24.48% responded can't say. Majority of the students (61.85%) felt it to be useful in comprehending the given topic. Most of the students (80.93%) agreed and strongly agreed that snowball method enabled in depth coverage of the topic. More than half (53.13%) responded agree and strongly agree that this method gives opportunity to clear doubts. Almost all the students (97.69%) agreed and strongly agreed that method helped in enhancing

communication skills. All of the students either agreed or strongly agreed that there is equal opportunity for every student for discussion in this method. Majority (67.05%) either disagreed or strongly disagreed that it is useful method even if you attend the session unprepared. None of the students agreed or strongly agreed that this method is enjoyable. More than three fourth (78.61%) either agreed or strongly agreed that teachers play an important role in this method of teaching and learning. None of the students agreed or strongly agreed that this method should be incorporated for all the topics in physiology.



Graph 1: Comparison between jigsaw and snowball method

Graph 1 shows comparison between jigsaw and snowball method for either agree or strongly agree responses. Higher proportion of students either agreed or strongly agreed for jigsaw method being simple, useful in comprehending the given topic, gave opportunity to clear doubts, useful method even if you attend session unprepared. None of the students responded either agree or strongly agree for snowball method to be enjoyable and should be incorporated for all the topics. There were almost similar responses for both the method in enhancing communication skills and equal opportunity for all the students. Whereas higher proportion of students either agreed or strongly agreed that in snowball method teachers play an important role as compared to jigsaw method.

Discussion

Present study found statistically significant difference in the mean scores of pre and post test ($P < 0.001$) after jigsaw as well as snowball method. Thus, both the method significantly improved the knowledge of students. Studies by Nusrath A.⁴ and Swathi A⁵

studied pre and post test scores by jigsaw method and found statistically significant difference.

Both the groups were comparable at the start and had similar level of knowledge for the allotted topics as depicted by pre test mean scores. Present study, did not find any difference in post test mean scores by using both the method. Thus, both the method were equally effective in covering the given topic and improving the knowledge of the students. Various other studies compared the scores of didactic lectures and small group teaching and found that there was better score using small group teaching.^{6,7,8} But there is lack of literature comparing jigsaw and snowball method.

Overall response based on the questionnaire about jigsaw method was positive. Students found it to be simple, enjoyable and effective means of learning. All the students responded the method being useful tool in enhancing communication skills. It is one of the basic aspects in self-directed learning. Similar findings were noted by various other studies.^{6,7,8}

In the present study, overall students found snowball method had in depth coverage of the topics. It improved communication skills. But less proportion of students found it to be simple. Majority of them responded that it is not useful if you attend session unprepared.

Present study compared jigsaw and snowball method. Higher proportion of students found jigsaw method to be simple, useful in comprehending the given topic, gave opportunity to clear doubts, useful method even if you attend session unprepared. There were almost similar responses for both the method in enhancing communication skills and equal opportunity for all the students. Whereas higher proportion of students found that in snowball method teachers play an important role as compared to jigsaw method.

None of the students responded either agree or strongly agree for snowball method to be enjoyable and should be incorporated for all the topics. Androgogy is the term used for adult learning⁹. In this type of teaching and learning students should actively and voluntarily participate in the process. Kar SS¹⁰ studied self-directed learning (SDL) readiness by calculating SDL scores among MBBS students. And they found a lower score among south Indian students. Study pointed out the need to address students' SDL skills and need for ways to build SDL skills. The curriculum system, teacher's experiences, student's background and cultural factors might contribute to the difficulties for the student's in conducting self-directed learning.¹¹

Conclusion

Jigsaw method of active learning is simple and enjoyable method of learning. Snowball method needs pre-preparation, covers topic in depth. Jigsaw as well as snowball method are equally effective in improving knowledge of the students. Both the method are highly useful in improving communication skills. Jigsaw method is preferred over snowball method by students for wide use.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Taken from institutional ethics committee.

Acknowledgement: We would like thank our students, who were backbone of our study.

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