



Impacts of Active Learning on Students' Academic Performance at Undergraduate Level Zoology Classes

Dr. S. M. Ali Ashraf

Dr. S. M. Ali Ashraf

Associate professor
Department of Zoology
Government Women's College
Khulna, Bangladesh
e-mail : ashrafzoology@gmail.com

Abstract

The purpose of the study was to investigate the impacts of active learning on students' academic performance compared to traditional learning. A sample of 30 undergraduate students from the Department of Zoology, Khulna Government Women's College, Bangladesh was used for the study. The total 30 students were randomly assigned as experimental group consisting of fifteen students and the control group from the remaining fifteen students. Each group was taught separately. The experimental group was taught by using some of the active learning strategies while control group was taught by the traditional lecture method only. The exam score of both groups of students were analyzed statistically and the results revealed that there was a significant difference ($p < 0.05$) between the means of the exam score of the two groups of students. Statistical analyses also revealed that the experimental group performed better than the control group. A survey on students' experiences regarding active learning was done through a questionnaire questions. In addition, observational data were recorded from both groups of students to view their responses in terms of active learning and traditional lecture method.

Keywords

Active learning, traditional learning, academic performance

Introduction

Teaching means bringing of desirable changes in learners.⁵ This change is not possible without the application of any suitable method used by the teachers. No method

becomes effective if it does not suit learners' needs. As a mode of instruction, the age-old lecture method is now neglected by educationists due to its inability to promote students' cognitive as well as attitudinal goals.^{13, 41} Lecturing is an ancient method of teaching which students commonly perceive as boring. Not only that, it is devoid of pleasure and diversity for students. Besides, this method is unable to spark student incitement, belief, confidence, liveliness and other qualities such as self-regulation.⁵⁴ As a result students complete their education without developing skills which is very important for the success in their professional life.^{26, 44}

In the lecture method classroom, students feel very shy in asking question to their teachers and the class room seems to be very lifeless. Students have no opportunity to share their own ideas with others. Hence in order to minimize the limitations of the lecturing method, attention has been given globally over the past few decades towards the approach that promotes active learning. This ensures student attitudes, critical power of thinking, grades and finally their increased academic performance without which the social and economic development of a country is difficult to attain.^{3, 21, 31}

From primary school to university level, active learning is poorly practiced in Bangladesh except a very few institutions mainly in urban areas.¹⁰ There are many factors behind this. Defective syllabuses, curricula, students number, classroom environment, duration of class time, teacher's knowledge of active learning method are important ones.⁴⁹ In Bangladesh, at undergraduate level Zoology classes teachers teach their students only by lecture method using "chalk and talk", textbooks and the like. As a result, students do not have chances to take part in their learning process. Students keep themselves mentally absent from class which has negative impacts on their academic attainments. In contrast, if active learning method is practiced, students have the opportunity to engage themselves and view their own ideas with their classmates as well as teachers. It is a two-way process.^{23, 36}

In active learning, students have the chances to solve their academic problem in the class independently. This type of learning practice helps learner to build clear understandings and attainment lasts long in their minds.¹² Moreover they enjoy themselves very much in the classroom and show more interest in the class.

Active learning may take place in different ways such as formative quizzes, role play, group discussion, study tour, lab work, individual assignment, debate, uses of ICT,

poster making, presentation and others.⁴⁷ Students deal with learning content through the active learning process which can enhance their thinking ability, finally impacting on their academic performance.^{18, 25}

Active learning means active participation of students with learning materials in the classroom through think-pair-share, peer discussion, collaborative work, analysis and application rather than simply to listen and memorize. Active learning includes not only group work, asking questions, explanations but includes planning and revision of the learning process also. Because of this practice, gained knowledge by active learning becomes permanent whereas in traditional lecture method students forget their achieved information very shortly.

Active learning is quite opposite to the traditional style of teaching where students just listen and absorb information offered by the teacher. In active learning student's role is considered prime. Kuh *et al.*, noted that active learning contributes golden chances for significant academic activities which have positive impacts on retention and performance.³⁰ According to Mills, active learning foster students thinking more critically and creatively.³⁷ It also explores student's personal mindset, integrity and sense of honor. Stern put forwarded the definition of active learning as it imparted students to decide which particular field of education is liked by them for study.⁴⁸ According to Prince, active learning involves students' recall of information significantly.⁴⁴ The famous education philosopher John Dewey mentioned that learning by doing is active learning.¹⁴

In active learning students take the chief responsibility and seek help from teachers only when needed. Active learning methods initiate students to gain something new with pleasure, improving their writing and speaking skill as well. Active learning method helps students to think critically.⁴⁹ This method increases individual thinking power and finally has positive impacts on their academic results. Emphasizing the huge benefits of active learning in mind, the chief focus of this study is fixed to observe and evaluate the impacts of active learning process on students' academic performance at undergraduate level Zoology Classes in Khulna Government Women's College, Bangladesh instead of the traditional lecturing method.

Review of Literature

The impacts of active learning methods in classroom management and students' academic success was studied by Odabasi and Kolburan who found that active learning helped them to remember the concepts permanently and this method is vital for their academic success.⁴⁰ Sometimes uses of chart, models, technology etc enhances students' academic performance. Pop-Pacurar and Tirla introduced models in biology classes as strategies of active learning and observed that students' average final score has increased by 2.03 points from the initial test whereas it was only 0.93 points who did not use models.⁴³ Model provides information through visual, tactile and auditory ways. An observation of Marlowe indicated that students' semester grade improved who watched video lecture and finished their assignment in class hour in comparison to those students who did not prevail this opportunity.³⁴ Greater students learning and conceptual understanding in upper division biology class takes place when interactive participation of students is ensured and effective learning is never possible without active engagement of students in the learning process.^{7, 28}

Mahendra *et al.*, emphasized the multicultural activities for better understanding of classroom learning instead of a single talk-chalk method.³³ An integration some strategies of active learning with traditional lecture method in a non major biology class and obtained significant improvement in conceptual understanding, responses and grading of students.³⁵ As strategies they used chart, model, journal, diagrams and others during classroom teaching. The effects of active learning on quality education both at private and public universities of Bangladesh was studied by Chowdhury and she pointed out some factors such as shortage of better infrastructure, modern class room facilities, trained teachers as well as large class size, excessive curricular loads, students prior experiences about active learning are the major hindrance behind the quality education.¹⁰ She also reported that most of the university teachers in Bangladesh believe that all students are alike in the class room and their needs are same. This conception is wrong because each student is unique in thinking, so a single strategy of teaching like chalk- talk is not enough for all students in the class. From the study, she recommended the introduction of training programs for junior and senior teachers, redesigning of class room in a way that will help group discussions and other interactive activities among the learners. Besides, she emphasized the use of computers, power point, videos and other reality based computer software to develop students' higher order of thinking.

In order to see the impacts of using students' personal mobile devices and laptops in higher education, Ghilay and Ghilay carried an experiment at Neri Bloomfield School of Design and Education, Haifa, Israel.²⁰ Sixty seven students took part in the research and they opined that courses based on mobile phone technology ensured their better engagement in learning process and improved academic attainment.

Redesigning of courses sometimes has positive effect on learning process. In order to evaluate the impacts of course redesign on attitudes and performances of students Armbruster *et al.*,⁴ performed an experiment on undergraduate level major and non major biology students for three successive years (2006-2008). For this, they reorder the presentation of the course content first, and then introducing active and problem based learning into every lecture and finally using strategies to ensure a more suitable environment for student centered learning. Student were taught according to above mentioned redesigning of course in 2007 and 2008 but in 2006 they were taught with primitive traditional lecture format only. Students three years performances were grades and analyzed statistically. Results revealed that attitudes and performances of students have increased significantly in 2007/2008 than 2006.

Freeman *et al.*, conducted an experiment to see the impacts of traditional versus active learning on examination score and failure rates of undergraduate college students of science discipline.¹⁸ Their investigation results revealed that student performance in examination increased by active learning compared with traditional lecturing method. Average failure rates of students were recorded as near about twenty two percent under active learning whereas it was thirty four percent under traditional lecture method.

Daniel performed an investigation by adding cooperative and collaborative activities in an undergraduate introductory biology courses to measure their impacts on students attendance and performance.¹² For this he divided two hundred sixty six students into two equal groups i.e., each group consisted of one hundred and thirty three students. Students of one group were allowed ten minutes time to discuss with peers before the test. The counter group (Control group) was not given the opportunity. A test was taken by fifty multiple choice questions which were identical for both groups. Results revealed that students who took part in pre exam group discussion were more confident and anxiety free in answering the questions whereas students of control group were so nervous and did several stupid mistakes.

The effectiveness of active learning method is studied by Slavin who stated that it motivates goal oriented behavior of learners.⁴⁶ Tynjala found that active learning helps to produce student better results more effectively than a traditional teacher centered method.⁵² The study of Prince advocated that use of active learning facilitates in improving student performance.⁴⁴

Deeper learning by active learning approach depends on a number of variables, these are teacher attitudes ⁶, ways of teaching ¹⁵, assessment ²², and teacher response also.⁵³ Moreover research revealed that student age, sex, subject discipline are directly correlated with student learning and achievement.^{16,51} Research also indicates that relevant course content, teachers' support and method of teaching are very crucial for more productive learning.^{38, 11, 4}

The investigation results of the Shah and Irshadullah demonstrated that student attendance, prior english grades, demographic factors etc are linked behind the development of academic performance in addition with active learning.⁴⁵ Similar results were also observed by Mushtaq and Khan who mentioned that proper guidance, family stress, communication skills are important factors that affects student performance.³⁹

Material and Methods

The investigation was carried out by mixed method as methodology. The quantitative data for this study were generated by analyzing the document of the students' exam score. A survey based on questionnaires was used as instruments to collect students' opinion as qualitative data. Ten structured questionnaire were developed after doing an extensive review of literature in order to find the students' experiences of experimental group only about active learning. Survey experiment is very important in making a very precise report and conclusion. The survey experiment also provides significant information about personal feelings, perceptions, attitudes, opinions, knowledge, etc of a group of targeted people.³² Besides, an observational data were also recorded from both groups of students on their responses in active and traditional learning.

Sampling

The study was carried out at Khulna Govt. Women's College , Bangladesh. It is located in the Khulna district, a southwestern part of the country. Thirty students of third year (Hons.) of the Zoology Department were the subject of this study who regularly takes

part in the classes. They were all female students and their aged between 21-22. Two equal groups were made randomly by the students. One is experimental group and other is control group. Each group was composed of fifteen students. Each group of students was instructed blood circulatory system, digestive and hormonal system of human body separately but the objectives of their course out lines, duration of class time, even text book were kept same for internal validity. Moreover in order to minimize the teaching variability both groups of students were taught by the same faculty member. Two classes per week and six weeks (from first week of April, 2019 to middle of the month of May, 2019) courses were selected for the study. Duration of each class was sixty minutes in length. The experimental group was taught by applying strategies of active learning whereas the classes of control group were taken only by using traditional chalk and talk method only. Power point, models, chart, cooperative group work, think -pair-share, debate, quick quizzes, muddiest point etc were used as active learning strategies for the students of experimental group. At the quit of the courses a test was taken by same multiple choice questions of twenty marks to compare the grades between the two groups. Students had been urged to view their experiences on five point Likert Scale ranging from 5 (strongly agree) to 1 (strongly disagree) about active learning method. Before conducting the research, ethical issues of quality research as described in University of Nottingham Malaysia Campus (UNMC) documentation were ensured and approved by the respective tutor.

Analysis of data

In order to view the impacts of two teaching methods on students' academic performance, data were analyzed by descriptive (mean, standard deviation, standard error) and inferential (independent t-test) statistics at the <0.05 significant level. At the end of the courses, the academic overall performance of experimental group was compared with the overall performance of students of control group. Besides, students have viewed their experiences through answering of questionnaire questions. In order to enhance validity and reliability, all results of the investigation were triangulated.

Results

Calculated exam score of the two groups of students are provided in Table I. Survey results of students' experiences about active learning of experimental group and observational results on different parameters of classroom activities of both groups of

students are provided in Table II and Table III respectively.

Table I: Descriptive results of two groups of students.

Group	Mean ± S.E,	N	T	D.F	Level of significance
Experimental group (active learning)	15.46 ± .47	30	2.81	28	0.05*
Control group (traditional learning)	13.40 ± .48				

[S.E.-Standard error; N-Number of Students; T- t-test results; D.F.-Degrees of Freedom]

The results of the present study revealed that performance of students under traditional lecture method is not praiseworthy in comparison to the results of active learning method. Students under traditional lecture method could not achieve higher grades in exam outcomes. Quantitative data of students’ exam outcomes indicated that a significant relationship (<0.05) exist between active learning and students’ performance. Students performed better on content taught by active learning method.

Table II: Students’ experiences about active learning method

Experiences of students	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly disagree
1. The class with power point, group work, debate and other forms of active learning was interesting.	9 (60%)	6 (40%)	0 -	0 -	0 -
2. The class environment was charming and easy to understand in active learning method.	8 (53%)	6 (40%)	1 (7%)	0 -	0 -
3. Class activities were helpful in building interaction between students and teacher or students with other students.	6 (40%)	6 (40%)	2 (13%)	1 (7%)	0 -
4. Active learning method helped you to review the key points of the contents or reach higher order of thinking.	6 (40%)	5 (33%)	3 (20%)	1 (7%)	0 -

5. Active learning method helped you to retain course material for a long time.	5 (33%)	4 (27%)	3 (20%)	2 (13%)	1 (7%)
6. Active learning method helped you to keep your attention throughout the class.	6 (40%)	3 (20%)	2 (13%)	2 (13%)	2 (13%)
7. Active learning method helped you to use cent percent class time efficiently.	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)
8. Active learning method helped you to take better notes during lesson.	3 (20%)	4 (27%)	4 (27%)	2 (13%)	2 (13%)
9. In active learning method do teachers value your potential to solve your problem?	4 (27%)	3 (20%)	3 (20%)	3 (20%)	2 (13%)
10. Active learning method is helpful for you to attain better results in your examination.	5 (33%)	3 (20%)	4 (27%)	2 (13%)	1 (7%)

Strongly Agree-5; Agree-4; Neither Agree nor Disagree-3; Disagree-2 and Strongly Disagree-1

From the table II it is assumed that active learning method inspire students to participate in lessons more actively via group work, making interaction with others, reviewing the key points, keeping attention throughout the class, proper use of valuable time etc. Not only that this method also helps them to retain the course material permanently and obtaining better result. In a word the entire class room seems to them very charming and delightful. So this method may be a very useful tool for classroom management.

Table III: Observational results of experimental group and control group.

Description / parameter	Group	No. of participants	Description of activity / respond
Students' attendance	Experimental	15	All students (cent percent) of this group attend in the class timely.
	Control	15	Seventy five percent students come timely but the remaining twenty five percent make delay to attend the class.

Class room interaction	Experimental	15	Excellent. Students want to solve a problem by interacting each other. They respect others' opinion.
	Control	15	Very weak or no sign of interaction.
Questioning in the class room	Experimental	15	Most of the students don't hesitate to ask question to their teachers
	Control	15	A very few (one or two) students ask questions to their teachers among the fifteen participants.
Answering question	Experimental	15	All are excited to give the answer.
	Control	15	They all feel shy in answering teachers questions
Group work participation	Experimental	15	Students feel pleasure to take part in group work, debate, presentations and other collaborative activities.
	Control	15	Students do not take part in group work
Class room environment (disinterest/ participatory)	Experimental	15	Participatory and friendly. Every student takes the responsibility of doing things from their own.
	Control	15	Monotonous, boring, disinteresting, one way etc.

Discussion

Fayombo showed that a significant positive correlation exist between the application of active learning strategies and students academic achievement which strongly supports the outcomes of present study.¹⁷ Haberyan gave an explanation of active learning which creates a student's affinity toward learning.²⁴ By active learning method students have an opportunity to discuss a thing in different ways with other members of the group and come to a decision about result on consensus basis that affects their exam grades positively which supports the results of present investigation. A comparative study between problem based and lectured based learning of Achuonye on eight hundred and ten secondary school science students in Nigeria has shown that problem based learning motivated the male students especially to learn biology more in comparison to lecture based learning which is in keeping with the results of the present study.¹ This high motivation come from the real life experiences and collaborative nature of problem

based learning strategy. The significance of problem based learning was reiterated by Tandogan and Orhan, who stated that enactment of problem based learning positively affects learner's intellectual progress and keeps their wrong thought at the reasonable level.⁵⁰

The effectiveness of active learning was studied by Ganyaupfu who stated that a combination of teacher centered and student centered approach is the most effective method which is firmly consistent with the results of present investigation.¹⁹ To determine the potential factors that affects student academic performance, Mushtaq and Khan carried out an experiment and found that communication, learning facilities and proper guidance have positive significant effect on student performance and the only family stress affects negatively the performance of students.³⁹

The effectiveness of team based learning (TBL) versus lecture based learning in sociology class was evaluated by Killian and Bastes who found that students in TBL classes obtained higher grades in their final exam than students in lecture based learning (LBL) classes.²⁷ The main causes of better performance of students in TBL classes are students are able to discuss a topic in different ways or brainstorming their ideas with others or give opinion in small groups which supports the results of present investigation. In a word, a tem based learning class is enjoyable and appealing. Academic performance was monitored by Aji and Khan and found that students passing rate in active learning classes was 61% whereas it was only 40% for the students in traditional class room.² The high and low performance under active learning and traditional learning respectively supports the outcomes of students of experimental group (active learning) and control group (traditional lecture method of learning) of present study. The investigation of Burt proved that motivation as well as performance of students improves by active learning through development of self confidence, metacognitive skill, and learning goals.⁹

A study of Kokabas demonstrated that students attitudes positively improved by cooperative learning, a sub dimension of active learning.²⁹ Statistical analysis of the investigation results of Pimolporn and Darrin demonstrated that use of active learning approaches positively increases students' attitudes towards their academic achievement which is in keeping with the findings of present study.⁴² Active learning of the present study helps students to construct a better understanding of the concepts more efficiently and obtain increased grades that is supported by the results of previous studies of

Armbruster, *al et.*,⁴ Bonwell & Eison⁸, Chowdhury¹⁰, Freeman, *et al.*,¹⁸. Not only that active learning helps learner to retain acquired knowledge for longer time because during learning they themselves remain active, performed activities in cooperation with their peers, try to learn something by doing.

Recommendations

- i) Emphasis to be given on teacher professional training especially in pedagogy, teaching methodology and ICT.
- ii) It is important to minimize class size i.e., students-teacher ratio for effective learning.
- iii) Importance to be given on the availability of teaching aids like computer, power point, projector, microscope, digital board, chart, model, etc without which implementation of active learning is difficult to carry out.
- iv) Importance to be given on the development of warm relationship between teacher and student.
- v) Active learning is poorly practiced in our country. So this method should be incorporated in syllabuses and curricula of higher education institutions in Bangladesh.
- vi) Before the introduction of active learning, try to convince the students about the benefits of active learning.

Conclusion

From the present study it is assumed that students engaged in active learning outperformed their counterpart which supports the superiority of active learning over the traditional learning method. Moreover questionnaire results indicated that the majority of the students showed their positive views towards the active learning approaches. Nevertheless the study may serve as basis for further studies to promote active learning strategies i.e., student direct engagement with course material, active collaboration, use of technology etc. Active learning plays an important role in class room management which ensures high satisfaction to the students in the present investigation. In addition to students' academic success, active learning method not only cultivates joyful and interactive classroom atmosphere but also helps them to recollect and keep obtained

knowledge permanently in their mind. Active learning method helps to develop students' metacognitive faculty also. So the active learning method ought to be incorporated in our educational system as a teaching method.

Acknowledgement

The paper is a part of the assignment of author's MA in Education courses at University of Nottingham Malaysia Campus (UNMC). The author is grateful to the UNMC authority and Ministry of Education (MoE), Bangladesh for their academic, financial and other necessary supports. The author is also thankful to the Principal of Khulna Govt. Women's College for giving permission and encouragement to conduct the research.

References

1. Achuonye, K. A. *A comparative study of problem-based and lecture-based learning in secondary school students' motivation to learn science*. International journal of science and technology Education Research, 1(6) 2010, Pp.126-131.
2. Aji,C.A., & Khan, M.J. *The impact of active learning on Students Academic performance*. Open Journal of Social Sciences, 7, 2019, Pp.204-211.
3. Ali, N., Jusoff, K., Ali, S., Mokhtar, N., & Salamat, A. S. A. *The factors influencing students' performance at Universiti Teknologi MARA Kedah, Malaysia*. Management Science and Engineering, 3(4), 2009. Pp. 81.
4. Armbruster, P., Patel, M., Johnson, E., & Weiss, M. *Active learning and student-centered pedagogy improve student attitudes and performance in introductory biology*. CBE—Life Sciences Education, 8(3), 2009, Pp. 203-213.
5. Ayeni, A. J. *Teachers' Professional Development and Quality Assurance in Nigerian Secondary Schools*. World journal of education, 1(1), 2011, Pp. 143-149.
6. Baeten, M., Kyndt, E., Struyven, K., & Dochy, F. *Using student-centred learning environments to stimulate deep approaches to learning: Factors encouraging or discouraging their effectiveness*. Educational Research Review, 5(3), 2010, Pp. 243-260.
7. Baxter, S., & Gray, C. *The application of student-centred learning approaches to clinical education*. International Journal of Language & Communication Disorders, 36(1), 2001, Pp. 396-400.
8. Bonwell, C. C., & Eison, J. A. *Active Learning: Creating Excitement in the Classroom*.

- 1991 ASHE-ERIC Higher Education Reports. ERIC Clearinghouse on Higher Education, The George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183.1991
9. Burt, J. *Impact of active learning on performance and motivation in female Emirati students*. Learning and teaching in higher education: Gulf Perspectives, 1(4), 2004, Pp.1-15.AAA
 10. Chowdhury F. Empliment of active learning at HELs in Bangladesh to improve education quality. *International Education Studies*, 9 (10), 2016, Pp.47-57
 11. Cortizo, J. L., Rodríguez, E., Vijande, R., Sierra, J. M., & Noriega, A. Blended learning applied to the study of Mechanical Couplings in engineering. *Computers & Education*, 54(4), 2010, Pp.1006-1019.
 12. Daniel, K. L. Impacts of active learning on student outcomes in large-lecture biology courses. *The American Biology Teacher*, 78(8), 2016, Pp. 651-655.
 13. Day, R. S. Teaching from notes: Some cognitive consequences. *New directions for teaching and learning*, (2), 1980, Pp.95-112.
 14. Dewey, J. Democracy and education (1916). *Middle Works Bd*, 9.1966
 15. Diseth, Å. Students' evaluation of teaching, approaches to learning, and academic achievement. *Scandinavian Journal of Educational Research*, 51(2), 2007, Pp. 185-204.
 16. Edmunds, R., & Richardson, J. T. (2009). Conceptions of learning, approaches to studying and personal development in UK higher education. *British Journal of Educational Psychology*, 79(2), 2009, Pp. 295-309.
 17. Fayombo, G. A. Active learning strategies and academic achievement among some psychology undergraduates in Barbados. *Journals, World Academy of Science, Engineering and Technology*, 7.2013
 18. Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 2014, Pp. 8410-8415.
 19. Ganyaupfu, E. M. Teaching methods and students' academic performance. *International Journal of Humanities and Social Science Invention*, 2(9), 2013, Pp. 29-35.
 20. Ghilay, Y., & Ghilay, R. TBAL: Technology-Based Active Learning in Higher Education.

Journal of Education and Learning, 4(4),2015, Pp.10-18.

21. Greitzer, F. L. A cognitive approach to student-centered e-learning. In *proceedings of the human factors and ergonomics society annual meeting* (Vol. 46, No. 25, 2002, Pp. 2064-2068). Sage CA: Los Angeles, CA: SAGE Publications.
22. Gulikers, J. T., Kester, L., Kirschner, P. A., & Bastiaens, T. J. The effect of practical experience on perceptions of assessment authenticity, study approach, and learning outcomes. *Learning and Instruction*, 18(2),2008, Pp. 172-186.
23. Gulpiner, M.A., & Yegen, B.C. Interactive learning for meaningful learning in large groups. *Medical teacher*;27(7), 2005, Pp. 590-594
24. Haberyan, A. Team-based learning in an industrial/organizational psychology course. *North American Journal of Psychology*, 9(1), 2007, Pp. 143.
25. Hacisalihoglu, G., Stephens, D., Johnson, L., & Edington, M. The use of an active learning approach in a SCALE-UP learning space improves academic performance in undergraduate General Biology. *PLoS one*, 13(5), 2018, 0197916.
26. Hake, R. R. Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American journal of Physics*, 66(1), 1998, Pp. 64-74.
27. Killian, M., & Bastas, H. The effects of an active learning strategy on students' attitudes and students' performances in introductory sociology classes. *Journal of the Scholarship of Teaching and Learning*, 15(3), 2015, Pp.53-67.
28. Knight, J. K., & Wood, W. B. Teaching more by lecturing less. *Cell biology education*, 4(4),2005, Pp. 298-310.
29. Kocabas, A. *İşbirlikli öğrenmenin blokflüt öğretimi ve öğrenme stratejileri üzerindeki etkileri* (Doctoral dissertation, DEÜ Sosyal Bilimleri Enstitüsü).1995.
30. Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. Unmasking the effects of student engagement on first-year college grades and persistence. *The journal of higher education*, 79(5), 2008, Pp. 540-563.
31. Lake, D. Student performance and perceptions of a lecture-based course compared with the same course utilizing group discussions. *Physical Therapy*, 81(3), 2001. pp. 896-902.
32. Leedy, P. D., & Ormrod, J. E. *Practical research*. Pearson Custom. (2005).
33. Mahendra, N., Bayles, K. A., Tomoeda, C. K., & Kim, E. S. Diversity and learner-centered

- education. *The ASHA Leader*, 10(16), 2005, Pp. 12-19.
34. Marlowe, C. A. The effect of the flipped classroom on student achievement and stress. 2012
 35. McClanahan, E. B., & McClanahan, L. L. Active learning in a non-majors biology class: lessons learned. *College Teaching*, 50(3), 2002, Pp. 92-96.
 36. Michael, j. Where is the evidence that active learning works? *Advances in Physiology Education*, 30, 2006, Pp.159-167
 37. Millis, B. J. Active learning strategies in face-to-face courses. 2012.
 38. Moulding, N. T. Intelligent design: Student perceptions of teaching and learning in large social work classes. *Higher Education Research & Development*, 29(2), 2010, Pp. 151-165.
 39. Mushtaq, I., & Khan, S. N. Factors Affecting Students Academic Performance. *Global journal of management and business research*, 12(9). 2012
 40. ODABAŞI, B., & KOLBURAN, G. Employment of Active Learning in Classroom Management and It's Effect on Student'Academiz Success. 2013
 41. Omelicheva, M. Y., & Avdeyeva, O. Teaching with lecture or debate? Testing the effectiveness of traditional versus active learning methods of instruction. *PS: Political Science & Politics*, 41(3), 2008, Pp. 603-607.
 42. Pimolporn, S & Darrin, T. The Relationship of Active Learning and Academic Achievement among Provincial University Students in Thailand. *APHEIT INTERNATIONAL JOURNAL* 7(1), 2018Pp.47-61
 43. Pop-Pacurar, I., & Tirla, F. D. Models Role within Active Learning in Biology. A Case Study. *Acta Didactica Napocensia*, 2(2), 2009, Pp. 41-50.
 44. Prince, M. Does active learning work? A review of the research. *Journal of engineering education*, 93(3), 2004, Pp. 223-231.
 45. Shah, A. A., & Irshadullah, H. M. The factors affecting students' academic performance at Abdul Wali Khan University Mardan, Pakistan. *Research Journal of Education*, 2018, Pp. 59-67.
 46. Slavin, R. E. Research for the future: Research on cooperative learning and achievement. *Contemporary Educational Psychology*, 21, 1996, Pp. 43-69.
 47. Soltanzadeh, L., Hashemi, S. R. N., & Shahi, S. The effect of active learning on academic

- achievement motivation in high schools students. *Archives of Applied Science Research*, 5(6), 2013, Pp. 127-131.
48. Stern, D. *Active learning for students and teachers: Reports from eight countries*. Peter Lang Pub Inc.1997.
49. Sultana, M., & Haque, M. S. The Cause of Low Implementation of ICT in Education Sector Considering Higher Education: A Study on Bangladesh. *Canadian Social Science*, 14(12), 2018, Pp. 67-73
50. Tandogan, R. O., & Orhan, A. (2007). The Effects of Problem-Based Active Learning in Science Education on Students' Academic Achievement, Attitude and Concept Learning. *Online Submission*, 3(1), 2007, Pp. 71-81.
51. Tetik, C., Gurpinar, E., & Bati, H. (2009). Students' learning approaches at medical schools applying different curricula in Turkey. *Kuwait Medical Journal*, 41(4), 2009, Pp. 311-316.
52. Tynjälä, P. Traditional studying for examination versus constructivist learning tasks: Do learning outcomes differ?. *Studies in Higher Education*, 23(2), 1998, Pp. 173-189.
53. Valk, A., & Marandi, T. How to support deep learning at a university. In *Proceeding of the international conference on education* .Vol. 200, 2005, Pp. 191-196).
54. Weimer, M. *Learner-centered teaching: Five key changes to practice*. John Wiley & Sons.2002.