

## Effect of Student Team Achievement Division on Concept Understanding of General Science at 6th Grade Students

Dr. Aftab Ahmad Khan  
Department of Education University of Jhang  
Email: [draftabahmad@uoj.edu.pk](mailto:draftabahmad@uoj.edu.pk); [tabijan71@gmail.com](mailto:tabijan71@gmail.com)

Zurriat Imran  
M.Phil. Scholar, Department of Education, University of Jhang  
Email: [imranzurriat143@gmail.com](mailto:imranzurriat143@gmail.com)

Dr. Muhammad Anees ul Husnain Shah  
Associate Professor, Department of Education, University of Education Lahore, D.G.  
Khan Campus  
Email: [draneesulhusnain@ue.edu.pk](mailto:draneesulhusnain@ue.edu.pk)

Received on: 05-10-2024

Accepted on: 06-11-2024

### Abstract

This study aimed to investigate the effect of Student Team Achievement Division (STAD) on understanding of General Science concepts. Sample for the study comprised of two classes of six grade students. Each of the class consisted of thirty students each. The instrument used in the study was a self-developed test for measuring understanding of General Science concept. On the basis of pretest both groups were randomly assigned to as control and experimental group. Treatment span was eight weeks. Results showed that STAD is an effective and relatively easy alternative to implemented to science education. Implementation of STAD yields a better understanding of General Science concept.

**Keywords:** Student Team Achievement Division, Concept understanding, General Science, Teaching Strategy

### Introduction

Understanding of concept involves a deep and meaningful grasp of a concept, going beyond mere memorization of facts or procedures. It entails understanding the underlying principles, relationships, and connections between different ideas. This type of understanding allows individuals to apply their knowledge flexibly to new situations and problems, rather than relying on rote learning or rigid formulas. It is about "knowing why" rather than just

---

"knowing that" (Xu, Wang, & Studer, 2021; Auernhammer, & Leifer, 2022). It involves actively constructing meaning, making connections between new information and prior knowledge, and developing a coherent mental framework for understanding a particular subject or topic (Wilkenfeld, 2023; Huang, 2023). This type of understanding is essential for critical thinking, problem-solving, and lifelong learning.

Concept understanding of our students is weak at about all levels of education. The problem is not limited to Pakistan only. It is a common problem across the globe. There may be several contributing factors. Some of the factors, as revealed by the literature have discussed in the following lines.

One of the contributing factor for weak concept understanding is inadequate prior knowledge (Smith, Snow, Serry, & Hammond, 2021). This lack the foundational knowledge needed to grasp new concepts leads students to weak understanding of new concepts. Some of the concepts are abstract and disconnected from everyday life. Such type of limited exposure to real-life applications of the learned piece of knowledge may lead to weak understanding of the concepts (Cheung, Bridges, & Tipoe, 2021; Wilkenfeld, 2023). Often in our schools, there is lack of opportunities to apply and reinforce learning. Insufficient practice and reinforcement cause weak understanding of concepts in our students (Chambers, Wyborn, Klenk, Ryan, Serban, Bennett, ... & Rondeau, 2022; Cheung et al., 2021). Rote memorization is common practice in our schools. Teachers as well as students focus on memorizing facts without understanding underlying principles (Chew, & Cerbin, 2021). Lack of Engagement in the learning plays an important role in students' leaning and motivation. Sometime boredom and disinterest in the subject matter weaken motivation and further weak concept understanding (Yacek, & Gary, 2023). Teachers may not cater to diverse learning styles or use engaging instructional strategies. Ineffective teaching methods may also result in weak understanding of concepts (Chew, & Cerbin, 2021; Wilkenfeld, 2023). Large class sizes can limit individual attention and personalized instruction and often weak understanding of concepts (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020).

In current study, an effort was made to enhance students' engagement and active participation in the learning through Student Team Achievement Division (STAD).

### **Objectives of the Study**

Following were the objectives of this study:

- i. To determine how well sixth graders grasp general science concepts using routine teaching.
- ii. To determine how well sixth graders' Concept Understanding of General Science is improved using the Student Team Achievement Division (STAD).

### **Research Questions**

- i. What is the average level of understanding of general science concepts among sixth graders in a traditional classroom setting?
  - ii. Are there significant differences in understanding of specific science concepts (e.g., matter, energy, force) among sixth graders in a traditional classroom setting?
  - iii. Does the implementation of STAD significantly improve sixth graders' understanding of general science concepts compared to traditional teaching methods?
-

### **Literature Review**

Students Team Achievement Division (STAD) is a cooperative learning method where students work together in small, diverse groups to achieve a shared learning goal. Literature has shown following key elements of STAD.

- i.** Team Formation:
  - a. Students are placed in small groups (usually 4-5 members) with diverse learning abilities.
  - b. This arrangement encourages peer tutoring and support.
- ii.** Team Study:
  - a. Groups work together to master the assigned material.
  - b. They help each other understand concepts, practice problems, and prepare for quizzes.
- iii.** Individual Quiz:
  - a. Students take an individual quiz to assess their understanding.
  - b. This quiz is graded, and scores are recorded.
- iv.** Team Scores:
  - a. Each team's score is calculated based on the improvement of individual members compared to their past performance.
  - b. This encourages collaboration and support within the team.
- v.** Team Recognition:
  - a. Teams that show significant improvement or achieve high scores are recognized and rewarded.

(Ghufron, 2023; Fika, 2020; Aryanti, & Widodo, 2020; Takko, Jamaluddin, Kadir, Ismail, Abdullah, & Khamis, 2020; Sa'adiyah, Syaiful, Hariyadi, & Yudistira, 2021).

Literature has revealed following benefits of using STAD in the classroom. Working in teams can make learning more interactive and fun. This enhances students' increased engagement in learning (Sa'adiyah et al., 2021; Awada, Burston, & Ghannage, 2020, Aryanti, & Widodo, 2020). Use of STAD improves academic performance. Peer support and collaboration can lead to better understanding and higher test scores (Shalaby, & Agyapong, 2020; Troussas, Krouska, & Sgouropoulou, 2020; Blau, Shamir-Inbal, & Avdiel, 2020). While using STAD in the classroom students learn to work together, communicate effectively, and support each other. This in turn enhances social skills (Aryanti, & Widodo, 2020; Halik, Naim, Musakkir, Mahsan, & Syamsu, 2023; Astuti, Mulyana, & Siman, 2021). STAD can create a more supportive and collaborative learning environment. It is a perfect step towards positive classroom environment (Awada et al., 2020; Ghufron, 2023; Fika, 2020; Aryanti, & Widodo, 2020)

Despite many advantages, the STAD model is not always easy to use. Juliansih, Hariyadi, & Anggereini, (2023) noted that one of the severe difficulties facing modern educational institutions is adaptation processes. Touwe and Lasaiba (2024) stated several problems and voids in applying the STAD model to classrooms. When it comes to kids not having access to digital devices, insufficient technical infrastructure is a huge problem.

Other critical barriers to the implementation of STAD include a lack of uniformity in teacher preparation. Many teachers require additional training before implementing this strategy effectively in their classrooms. It is estimated that about 40% of teachers consider including

---

STAD and other types of cooperative learning in the curriculum as unsure (Tabatabaei & Heidari Shahreza, 2022). According to Asmedy (2021), if sufficient support and training are provided to the teachers, they can facilitate student collaboration much more effectively and optimize the learning outcomes. Managing the group dynamics in a large class with varied abilities is very difficult. Ineffective implementation of STAD, without proper support and guidance, might lead to less desirable learning outcomes, as Hariyanto, Citra, Silaban, & Edwar, (2023) opined.

Given that the focus of education nowadays is on 21st-century skills, this STAD model could be highly instrumental in helping students acquire real-life skills relevant to their lives in the modern world. In this respect, it is crucial to determine how this paradigm should be implemented. According to Asmedy (2021), teachers must make activities and assignments according to students' capabilities, forming heterogeneous groups and responding positively. Group collaboration and discussion of what they learn at school motivate the students to become more interested in their education. This kind of discussion and understanding between each other can facilitate the students' process ability a lot, and it was also suggested by Misbah and Rasyid (2022). It allows and encourages kids to be more involved with education, which is a plus. Some of the aims of STAD learning paradigms are to achieve academic success and develop specific skills within the student, including critical thinking, communication, teamwork, and problem-solving skills. As it teaches kids to think and find things independently, it sets them up to face the world (Sirait, Sirait, & Jeni, 2024).

Research has also shown that the STAD model enhances student cooperation and performance. Since the STAD model has established teams, students with different strengths and weaknesses have been able to collaborate because their outcomes would be better (Kamid, Winarni, Rohati, Pratama, & Triani, 2022). According to the study by Touwe and Lasaiba (2024), this model influences social and emotional development regarding cooperation in students.

### **Research Methodology**

The study was quantitative in nature and true experimental design was used. All public sector elementary schools were the population of the study. The sample of the study was randomly selected one elementary school and students of six grade level. They were sixty in numbers. All sixty students were pretested and equated on the basis of pretest scores and randomly divided into experimental and control groups. Each group consisted of thirty students each. The control group was taught using routine teaching and the experimental group received treatment through Student Team Achievement Division method. The treatment span was eight weeks, forty minutes class daily. After the treatment, both groups were post-tested. The instrument used in the study was developed by the researcher himself. It consisted of nine items, each with two to three sub-items. The instrument was validated and then pilot tested. The reliability coefficient was .81.

Both pretest and posttest score were analyzed through SPSS using descriptive statistics like mean and standard division and inferential statistics like t-test and the results were displayed in tabular form and then interpreted.

---

Table 1 *Sample of the Study*

School	Grade	Control Group	Experimental Group	Total
One selected elementary school and its students of a particular grade	6 <sup>th</sup>	30	30	60

Table 2 *Comparison of the control and experimental group before treatment*

Group	T. Scores	N	M	SD	<i>t</i>	df	<i>p</i>
Control	40	30	6.75	.45	-.99	58	.332
Experimental			6.80	.40			

The experimental group had a mean score of 6.86 and the control group of 6.75, as shown in Table 2 of the study's pre-test results. Since  $p > 0.05$  and the t-test result was (-.99), we can say there is no statistically significant difference.

Table 3 *Comparison of the control and experimental group after treatment*

Group	T. Scores	N	M	SD	<i>t</i>	df	<i>p</i>
Control	40	30	12.22	.39	-18.44	.000	.75
Experimental			24.58	.29			

A comparison of experimental and control post-test results is presented in Table 3. The control group had a mean value of 12.22 and 24.58 compared to the experimental group. A significant difference was found with a t-test value of (-18.44),  $p < 0.05$ . The  $\eta^2$  value was (0.75) which shows a very large effect and better achievement of experimental group after the treatment.

Equal ability students of experimental group did better after the treatment with larger effect size. This clearly indicates that Students Team Achievement Division is a better alternative for developing understanding of the concepts.

### Discussion

The data analysis showed that the students' concept understanding across selected concepts of General Science of elementary level textbook was low before the treatment. The students of the experimental group after going through the treatment using Student Team Achievement Division (STAD) showed a higher level of the mastery of the concepts. These results are in alignment with Pawattana, Prasarnpanich, & Attanawong, (2014), Yuliawati (2018), Ari and Sadi (2019), Isnaini and Kurniawan (2020), Agadzi (2020), and Erawati, , Setyawan, & Putra, (2024).

The cooperative learning method, Student Teams-Achievement Divisions (STAD) is a better method for elementary level students. It involves dividing students into small, heterogeneous teams of four or five members. In such a group students are better able to interact with each other and learn in a better way. Each team is composed of students with varying abilities, ensuring that both high-achieving and low-achieving students are included. The teacher presents a new lesson or concept to the entire class in a clear, concise, and engaging manner covering the essential information students need to understand. Students work together in

teams to master the material or the concept. They can use worksheets, quizzes, or other activities provided by the teacher to reinforce their learning. They help each other, explain concepts, and answer questions. The teacher is always there to guide and help them. Team scores are calculated based on the improvement of each team member's quiz score compared to their previous performance. Teams that show significant improvement are recognized and rewarded, fostering a sense of competition and motivation. Students rely on each other to succeed, as their individual scores contribute to the team's overall performance. This instills in students a sense of individual accountability.

Thus STAD enhanced:

- i. Improved Academic Achievement and concept understanding.
- ii. Student Engagement in learning.
- iii. More engaging and motivating learning environment.
- iv. Positive social skills such as communication, cooperation, and problem-solving.
- v. Positive attitudes toward learning by emphasizing teamwork, support, and recognition.

### **Conclusion**

STAD is a viable, easy-to-implement, and highly effective alternative to more conventional ways of teaching general science concepts to students. Students' cognitive load can be significantly reduced, their long-term memory of concepts can be improved, and the problem of low basic concept understanding among sixth graders can be solved by applying STAD. In addition to making teachers' lives easier, STAD helps students grasp scientific jargon. The principles taught in the Student Team Achievement Division apply to students' everyday lives. Students' understanding of fundamental scientific concepts and vocabulary is significantly enhanced via the Student Team Achievement Division.

### **Recommendation**

1. The STAD approach to teaching science should be a part of the sixth-grade science curriculum so students can benefit from it.
2. For STAD to be successfully implemented, teacher training is crucial, and good motivation is also required.
3. Teachers should also ensure students are well-versed in STAD and have plenty of opportunities for cross-practice.

### **References**

1. Agadzi, W. I. N. F. R. E. D. (2020). *Improvement of students' performance on titrimetric analyses in Breman Asikuma Senior High School using student team achievement division A case study* (Doctoral dissertation, University of Education Winneba).
  2. Ari, D., & Sadi, Ö. (2019). Effectiveness of cooperative learning on students' achievement in genetics, self-efficacy and conceptions of learning biology. *ie: inquiry in education*, 11(2), 4. <https://doi.org/https://doi.org/10.31004/innovative.v4i3.11211>
  3. Aryanti, Y., & Widodo, E. (2020). The effectiveness of Student Team Achievement Divisions (STAD) cooperative learning in science learning on analysis skills and social skills. *Journal of Science Education Research*, 4(1), 22-27. <https://doi.org/10.2183/jsr.v4i1.34237>
  4. Asmedy, A. (2021). Pengaruh Model Pembelajaran Kooperatif Tipe STAD Terhadap Hasil Belajar
-

- Siswa Sekolah Dasar. *Ainara Journal (Jurnal Penelitian Dan PKM Bidang Ilmu Pendidikan)*, 2(2), 108-113. <https://doi.org/10.58536/j-hytel.v1i3.92>
5. Astuti, S., Mulyana, R., & Siman, S. (2021). The Effect of STAD Type Cooperative Learning Models and Students' Social Skills on the Fifth Grade Students Learning Outcomes at Cinta Rakyat State Primary School. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, 4(1), 412-422. <https://doi.org/10.33258/birle.v4i1.1654>
  6. Auernhammer, J., & Leifer, L. (2022). Innovation for the real-world through knowing why. In *Living beyond data: Toward sustainable value creation* (pp. 29-38). Cham: Springer International Publishing.
  7. Awada, G., Burston, J., & Ghannage, R. (2020). Effect of student team achievement division through WebQuest on EFL students' argumentative writing skills and their instructors' perceptions. *Computer Assisted Language Learning*, 33(3), 275-300. <https://doi.org/10.1080/09588221.2018.1558254>
  8. Chambers, J. M., Wyborn, C., Klenk, N. L., Ryan, M., Serban, A., Bennett, N. J., ... & Rondeau, R. (2022). Co-productive agility and four collaborative pathways to sustainability transformations. *Global Environmental Change*, 72, 102422. <https://doi.org/10.1016/j.gloenvcha.2021.102422>
  9. Cheung, C. C., Bridges, S. M., & Tipoe, G. L. (2021). Why is anatomy difficult to learn? The implications for undergraduate medical curricula. *Anatomical Sciences Education*, 14(6), 752-763. <https://doi.org/10.1002/ase.2071>
  10. Chew, S. L., & Cerbin, W. J. (2021). The cognitive challenges of effective teaching. *The Journal of Economic Education*, 52(1), 17-40. <https://doi.org/10.1080/00220485.1845266>
  11. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied developmental science*, 24(2), 97-140. <https://doi.org/10.1080/10888691.2018.1537791>
  12. Erawati, N. K., Setyawan, I. K. A., & Putra, I. G. P. P. (2024). Application of a Cooperative Learning Model of Student Teams Achievement Division Type to Improve Student Achievement in Mathematics Lessons. *IJESS International Journal of Education and Social Science*, 5(1), 112-117. <https://doi.org/10.56371/ijess.v5i1.260>
  13. Fika, R. (2020). The effectiveness of Jigsaw and STAD (student team achievement division) cooperative learning model on pharmaceutical mathematics. *Journal of Advanced Pharmacy Education and Research*, 10(2-2020), 147-158.
  14. Ghufron, S. (2023). The Effect of STAD-Type Cooperative Learning Based on a Learning Tool on Critical Thinking Ability in Writing Materials. *International Journal of Instruction*, 16(1). <https://doi.org/10.33258/birle.v3i2.959>
  15. Halik, A., Naim, M., Musakkir, M., Mahsan, S., & Syamsu, T. (2023). Student Teams-Achievement Division (STAD) To Increase Students' Social and Spiritual Intelligence. *Edukasi Islami: Jurnal Pendidikan Islam*, 12(001). <https://doi.org/10.30868/ei.v12i001.5613>
  16. Hariyanto, S. R., Citra, F. W., Silaban, N., & Edwar, E. (2023). Penerapan Model Pembelajaran Kooperatif Tipe STAD (Students Teams Achievement Division) Pada Pembelajaran Geografi Dalam Meningkatkan Hasil Belajar Siswa Kelas X Di Madrasah Aliyah Tarbiyah Islamiyah Kerkap. *Jurnal Georafflesia: Artikel Ilmiah Pendidikan Geografi*, 8(1), 43-47. <https://doi.org/https://doi.org/10.32663/georaf.v8i1.3951>
  17. Huang, Y. (2023). Conceptual Knowing-How-Based Theoretical Wisdom. *Philosophia*, 51(5), 2697-2713. <https://doi.org/10.1007/s11406-023-00707-z>
  18. Isnaini, F., & Kurniawan, M. I. (2020). The Concept of STAD (Student Team Achievement Division) Cooperative Learning Model According to Robert E. Slavin. *Indonesian Journal of Education Methods Development*, 10, 10-21070. <https://doi.org/10.21070/ijemd.v10i.561>
  19. Juliansih, P., Hariyadi, B., & Anggereini, E. (2023). Pengembangan Lembar Kerja Peserta Didik Berbasis Project Based Learning Untuk Pembelajaran Ipa Terintegrasi Materi Gambut. *Jurnal*
-

- 
- Binomial*, 6(2), 155-171. <https://doi.org/https://doi.org/10.46918/bn.v6i2.1827>
20. Kamid, K., Winarni, S., Rohati, R., Pratama, W. A., & Triani, E. (2022). Student Team Achievement Division Learning Model and Student Process Skills. *Jurnal Ilmiah Sekolah Dasar*, 6(1), 1-10. <https://doi.org/10.23887/jisd.v6i1.42456>
21. Misbah, Z., & Rasyid, A. (2022, October). Pengaruh Model Pembelajaran STAD Dengan Metode Demonstrasi Terhadap Peningkatan Hasil Belajar Dan Keterampilan Proses Belajar Siswa SMP. In *Prosiding Seminar Nasional Pendidikan* (Vol. 4, pp. 335-342). <https://prosiding.unma.ac.id/index.php/semnaskip/article/view/815/643>.
22. Pawattana, A., Prasarnpanich, S., & Attanawong, R. (2014). Enhancing primary school students' social skills using cooperative learning in mathematics. *Procedia-Social and Behavioral Sciences*, 112, 656-661. <https://doi.org/10.1016/j.sbspro.2014.01.1214>
23. Sa'adiah, H., Syaiful, S., Hariyadi, B., & Yudistira, P. (2021). Student team achievement divisions (STAD) and jigsaw learning in terms of numerical abilities: The effect on students' mathematics learning outcomes. *Desimal: Jurnal Matematika*, 4(3), 247-260. <https://doi.org/10.24042/djm.v4i3.9746>
24. Shalaby, R. A. H., & Agyapong, V. I. (2020). Peer support in mental health: literature review. *JMIR mental health*, 7(6), e15572. <https://doi.org/10.2196/15572>
25. Sirait, R. W., Sirait, S. H. K., & Jeni, J. (2024). The Implementation of the STAD learning model to improve students' learning outcomes. *JISTECH: Journal of Information Science and Technology*, 4(1), 59-66. <https://doi.org/10.30862/jri.v4i1.317>
26. Smith, R., Snow, P., Serry, T., & Hammond, L. (2021). The role of background knowledge in reading comprehension: A critical review. *Reading Psychology*, 42(3), 214-240. <https://doi.org/10.1080/02702711.2021.1888348>
27. Tabatabaei, O., & Heidari Shahreza, M. A. (2022). Using the STAD Model of Instruction to Enhance Learners' General Achievement and Creativity. *Journal of Language and Translation*, 12(1), 125-139. <https://doi.org/10.17977/um067v4i22024p2>
28. Takko, M., Jamaluddin, R., Kadir, S. A., Ismail, N., Abdullah, A., & Khamis, A. (2020). Enhancing higher-order thinking skills among home science students: The effect of cooperative learning student teams-achievement divisions (STAD) module. *International Journal of Learning, Teaching and Educational Research*, 19(7), 204-224. <https://doi.org/10.26803/IJLTER.19.7.12>
29. Touwe, S., & Lasaiba, M. A. (2024). Enhancing Science Education through the Student Teams Achievement Division (STAD) Learning Model: An Experimental Study on Process Skills and Learning Outcomes at Middle School. *AL-ISHLAH: Jurnal Pendidikan*, 16(2). <https://doi.org/10.35445/alishlah.v16i2.5372>
30. Troussas, C., Krouska, A., & Sgouropoulou, C. (2020). Collaboration and fuzzy-modeled personalization for mobile game-based learning in higher education. *Computers & Education*, 144, 103698. <https://doi.org/10.1016/j.compedu.2019.103698>
31. Wilkenfeld, D. A. (2023). Understanding Necessarily and Understanding Actually. *Journal for General Philosophy of Science*, 54(2), 287-303. <https://doi.org/10.1007/s10838-022-09611-8>
32. Xu, C., Wang, Y., & Studer, T. (2021). A logic of knowing why. *Synthese*, 198(2), 1259-1285. <https://doi.org/10.1007/s11229-019-02104-0>
33. Yacek, D. W., & Gary, K. (2023). The uses and abuses of boredom in the classroom. *British Educational Research Journal*, 49(1), 126-141. <https://doi.org/10.1002/berj.3833>
34. Yuliawati, D. (2018). Implementation Of Cooperative Learning Model Student Teams-Achievement Division (STAD) Type To Improve Student Cooperation In Social Science Learning (Classroom Action Research Class VII-D SMP Negeri 1 Bandung). *International Journal Pedagogy of Social Studies*, 2(2), 25-31. <https://doi.org/10.17509/ijposs.v2i2.10160>
-