EFFECTS OF ONLINE COOPERATIVE LEARNING (OCL) USING STUDENT TEAMS ACHIEVEMENT DIVISION (STAD) METHOD TO THE MOTIVATION, SELF – EFFICACY, AND ACADEMIC ACHIEVEMENT OF STUDENTS IN SCIENCE 10

JO ANGELI IPO ONG
joangeli.ong@deped.gov.ph
Department of Education, Ocampo National High School
San Francisco, Ocampo Camarines Sur, Philippines

ABSTRACT

This study explores the impact of Online Cooperative Learning (OCL) using the Student Teams Achievement Divisions (STAD) method on Science 10 students' self-efficacy, motivation, and academic achievement. Conducted at Ocampo National High School during the COVID-19 pandemic, the quasi-experimental design involved 90 tenth-grade students split into control and treated groups. Pre- and post-experiment assessments included Likert-scale questionnaires on motivation and self-efficacy, along with summative tests. Data analysis, conducted with R software, employed descriptive statistics, t-tests, Wilcoxon signed-rank tests, and Structural Equation Modeling (SEM). Results indicated significantly heightened motivation (weighted mean=4.17, $p=0.056$), increased self-efficacy (weighted mean=4.2, $p=0.04$), and improved academic performance (weighted mean=38.69, $p=0.00$) among students using OCL-STAD. Path analysis revealed the direct effects of self-efficacy on academic achievement (path coefficient=0.25) and motivation (path coefficient=0.04).

Keywords: motivation, online cooperative learning, Student Teams Achievement Divisions (STAD) method, self-efficacy

INTRODUCTION

Remote learning brought about by the pandemic has resulted in students' difficulties engaging with their peers and having meaningful collaboration for effective learning. Studies revealed that poor peer communication, feeling the need to socialize, inability to communicate with friends, and lack of support are some of the difficulties encountered by students during the pandemic (Rotas & Cahapay, 2020; Özüdoğru, 2021). These caused lesser self–efficacy and motivation to learn and perform well in academics among students.

In Science education, researchers have focused on motivational beliefs and processes, including the self-efficacy of students (Villafane et al., 2014; Mataka & Kowalske, 2015).
Studies have found that self-efficacy impacts learning the subject and achieving a positive academic outcome (Ramos & Stephen, 2018; Ste-Marie et al., 2015; Diseth et al., 2012; Sergent, 2018; Chang et al., 2013; Husain; 2014).

Studies have shown that cooperative learning has been widely used on the face–to–face classroom instructions, and was used in remote education. Previous studies have investigated the impact of cooperative learning approaches on

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com

ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

13

students' academic achievement in Biology (Molla & Moche, 2018), its effect on student's achievement in genetics, self–efficacy, and conceptions of learning Biology (Ari & Sadi, 2019), cooperative learning in distance learning (Mundy et al., 2012), the effects of collaborative learning in the academic achievement and knowledge retention (Tran, 2014), the impact of cooperative learning and models on the conceptual understanding of the chemical reactions (Doymus et al., 2019), and fostering achievement of low-, average-, and high achiever students in Biology through structures cooperative learning (Yaduvanshi & Singh, 2019). However, most of these studies are related to face–to–face collaborative learning using the Student Teams Achievement Divisions (STAD) method.

Moreover, few studies focused on online collaborative learning using the STAD method. These few investigations explored areas such as the STAD-type cooperative learning design to develop student online learning activities (Sjafei, 2021), the influence of web-based collaborative learning strategy to achieve motivation in student study outcomes (Hariadu & Wurijanto, 2016), STAD technique through Moodle to enhance learning achievement (Tiantong & Teemuangsai, 2013), and development of online science learning devices cooperative model-type STAD assisted by video media.

Unfortunately, there are only two (2) studies in the Philippines related to face–to–face cooperative learning using the STAD. First is the research of Gonzales and Torres (2016) on Filipino learners' attitudes toward collaborative learning and their relationship to reading comprehension. Second is the use of the STAD Model in teaching Chemistry and its effect on students' academic performance by Lantajo and Tipolo (2018). Nevertheless, no published literature in the Philippines connected to online cooperative learning utilizing the STAD approach, notably in Junior High School, Grade 10 Level, covering the Most Essential Learning Competencies (MELC) in Biology identified by the Department of Education.

These underscored the implementation of a study on the effects of online cooperative learning using the STAD method on the motivation, self–efficacy, and academic achievement of students in Science 10.

OBJECTIVES OF THE STUDY

The study aimed to ascertain the impacts of the OCL-STAD method on the motivation, self-efficacy, and academic achievement of grade 10 students in Science at Ocampo National High School, Ocampo, Camarines Sur. Its specific objectives were to:

1. Assess students' motivation, self-efficacy, and academic achievement in traditional classroom settings versus Online Cooperative Learning (OCL) using the Student Teams Achievement Divisions (STAD) Method.

2. Measure the shifts in students' motivation, self-efficacy, and academic achievement from traditional classroom instruction to Online Cooperative Learning (OCL) employing the Student Teams Achievement Divisions (STAD) Method.

3. Examine the correlations between motivation, self-efficacy, and achievement within traditional classroom settings and the OCL-STAD method.

METHODOLOGY

This study utilized a quasi-experimental design to establish causal relationships. It focused on grade 10 students at Ocampo National High School in San Francisco, Ocampo Camarines Sur. A purposive sampling technique, specifically homogeneous sampling, was employed.

Grade 10 students with internet access were selected and divided into two groups: the treatment group and the control group. Randomization was used to allocate students into these groups. The treatment group received instruction using the OCL-STAD method, while the control group received traditional online instruction. Both groups completed the Students' Motivation Toward Science Learning (SMTSL) survey, the Self-efficacy Toward Science Learning

(STSL) survey, and a 50-item assessment tool before and after the study.

The total number of respondents was ninety (90) grade 10 students. Table 1 provides the distribution of these respondents.

Table 1
Distribution of the Respondents of the Study

Groups	Males	Females	Total Number of students
1. Experimental Group	14	31	45
2. Control Group	19	26	45

The study focused on student's motivation, self-efficacy and academic achievement using the OCL-STAD method. Three sets of instruments were used to gather pertinent data with regards to the study: (1) Students' Motivation towards Science Learning (SMTSL) Survey Questionnaire; (2) Self–Efficacy Survey Questionnaire; and (3) Assessment tools.

The survey questionnaires and assessment tools were validated by four (4) experts and piloted to 20 students to test its reliability. The instruments received an excellent validity rating.

Administration of the Pre-Test. The SMTSL, SSTSL, and assessment tools were pretested to forty-five grade 10 student-respondents from the treated group and forty-five from the control group of Ocampo National High School in the third quarter of the school year.

Implementation of the OCL–STAD method and Regular Online Classroom. The OCL-STAD method was implemented in the treated group for seven weeks every morning from 9 to 10 o'clock. However, the regular online classroom was implemented in the control group for seven weeks every afternoon from 2 o'clock to 3 o'clock.

The implementation of the study was conducted from March 7 – April 22, 2022, through Google meet both in the treated and control group. *Administration of Post Test*

After the implementation of the OCL–STAD method and Regular Online classroom, the Students' Motivation towards the Science Learning questionnaire (SMTSL), Students' Self - efficacy toward the Science Learning questionnaire (SSTSL), and assessment post-tested to measure the improvement of the students after the implementation of the OCL – STAD Method and regular online classroom.

Descriptive statistics such as frequency and mean were employed to analyze the motivation, self–efficacy, and academic achievement.

Mean: $X = \frac{[Fsa*5 + Fsa*4) + (FA*3 + FMD*2) + (Fsd*1]}{N}$

T-test and Wilcoxon's signed rank were employed to determine the differences in motivation, self–efficacy, and academic achievement between the control and treatment groups.

The relationship between motivation, self-efficacy, and academic achievement was determined using the Structural Equation Modeling (SEM) Path analysis. The general equation for the SEM Path analysis model in this study will be: AC = a*MOT + b*SEF + error
Where:

AC = Academic Achievement

MOT = Motivation

SEF = Self–efficacy

a = path directing the direct effect of motivation on academic achievement

b = path directing the direct effect of self-efficacy on academic achievement

RESULTS AND DISCUSSION

1. Students' motivation, self-efficacy, and academic achievement in a regular online classroom and an Online Cooperative Learning (OCL) following the Student Teams Achievement Divisions (STAD) method

Results showed that in terms of motivation, the treated group posted almost similar ratings described as highly motivated during the pre-test.

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com

ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

15

However, during the post-test, the treated group posted an overall weighted mean of 4.17, described as highly motivated, against the overall weighted mean of the control group computed at 3.90, described as highly motivated.

The motivation, self-efficacy, and academic achievement of students in the treated and control group are summarized in Table 2.

Table 2
Summary of Respondents' motivation, self-efficacy, and academic achievement

		Motivation		Self – Efficacy		Academic Achievement
		Overall Weighted Mean	Description	Overall Weighted Mean	Description	Overall Weighted Mean
Treated Group (OCL-STAD Method)	Pre-test	3.53	High	3.28	High	26.36
	Post-test	4.17	High	4.2	Very High	38.69
Control Group (Regular Online Classroom)	Pre-test	3.52	High	3.50	High	24.38
	Post-test	3.90	High	4	High	33.36

Results showed that in terms of motivation, the treated group posted almost similar ratings described as highly motivated during the pre-test.

However, during the post-test, the treated group posted an overall weighted mean of 4.17, described as highly motivated, against the overall weighted mean of the control group computed at 3.90, described as highly motivated.

The difference between the two groups was marginally significant (p=0.056 at $p<0.05\alpha$). The slight increase registered for the treated group against the control group indicated that students subjected to the OCL–STAD method demonstrated relatively increased motivation in learning.

Regarding self-efficacy, results showed that the treated group posted an overall weighted mean of 3.28, described as highly confident, against the overall weighted mean of the control group computed at 3.50, described as highly confident during the pre-test. The difference between the two groups before the intervention implementation was significant (p=0.00 at $p<0.05\alpha$).

However, during the post-test, the treated group posted an overall weighted mean of 4.2, described as very highly confident, against the overall weighted mean of the control group computed at 4.0, described as highly secure.

The difference between the two groups was significant (p=0.04 at $p<0.05\alpha$). The slight increase registered for the treated group against the control group indicated that students subjected to the OCL-STAD method demonstrated comparatively increased self-efficacy in learning.

As for academic achievement, results showed that the treated group posted an overall weighted mean of 26.36 against the control group's average of 24.38 on the pre-test. The difference between the two groups before the intervention implementation was not significant (p= 0.21 at $p<0.05\alpha$).

However, during the post-test, the treated group posted an overall weighted mean of 38.69 against the control group's average of 33.36.

The difference between the two groups was significant (p= 0.00 at $p<0.05\alpha$). The substantial increase registered for the treated group against the control group indicated that students subjected to the OCL-STAD method demonstrated significantly increased academic achievement in learning.

The results showed that the students under OCL – the STAD method outperformed those who received standard online classroom instruction. In terms of motivation, the treated group showed a slight increase compared to the control group and is considered highly motivated. The difference between the two groups is marginally significant. Regarding self-efficacy, the treated group demonstrated a significantly higher self-efficacy than the control group. The difference between the two groups was found to be substantial.

Table 3
Test of Difference between Groups

Compared Groups	Motivation (P value)	Significance	Self – Efficacy (P value)	Significance	Academic Achievement (P value)	Significance
Pre-test of the control group vs. Pre-test of the treated group	0.86	Not Significant	0.00	Significant	0.21	Not Significant
Post-test of the control group vs. Post-test of the treated group	0.056	Marginally Significant	0.04	Significant	0.00	Significant

2. **Change in Motivation, Self – Efficacy, and Academic Achievement of Students in the OCL-STAD Method and Regular Online Classroom**

Table 4
Net Change of Motivation, Self-Efficacy, and Academic Achievement of students

		Motivation	Self-efficacy	Academic Achievement
		Overall Weighted Mean	Overall Weighted Mean	Overall Weighted Mean
Treated Group (OCL-STAD Method)	Pretest	3.53	3.28	26.36
	Post-test	4.17	4.2	38.69
	Change	0.65	0.92	12.33
Control Group (Regular Online Classroom)	Pretest	3.52	3.55	24.38
	Post-test	3.9	3.79	33.36
	Change	0.38	0.244	8.98
Net Change		0.27	0.68	3.36

Table 4 shows that students' motivation in the treated group had a significant change of 0.645 before and after the intervention implementation. In contrast, the motivation of the students in the control group had a significant change of 0.376. It means that the use of the OCL-STAD method can motivate more towards Science learning more than the use of a regular online classroom having a net change of 0.269.

Likewise, the change in self-efficacy in the treated group and control group before and after the implementation of the intervention was significant. It yielded a difference of 0.918 and 0.236, respectively. However, the treatment group's change was more significant than the control group. Thus, utilizing the OCL-STAD method can boost the students' self–efficacy toward Science learning rather than the regular online classroom having a net change of 0.682.

Similarly, the change in students' academic achievement in the treated group and control group before and after the implementation of the intervention was significant, with a difference of 12.333 and 8.978, respectively.

Using the OCL-STAD method can be more effective than using the regular online classroom in terms of improving academic achievement in Science. This indicates that the OCL-STAD method is a more significant approach. The OCL–STAD approach has a considerable effect on students' academic achievement. When learners cooperate and share their thoughts within the group, motivation increases, and development and learning occur. Consistent with the findings of Hermawan (2020), the STAD approach improves student learning outcomes. Also, Gull et al. (2015) determined that the adoption of cooperative learning had a positive impact on student's academic achievement.

The OCL-STAD Method boosts learners' self-efficacy by encouraging them to develop self-confidence. Also, students' motivation improved as they worked together, were guided, and were assisted by skilled peers. With this intervention, the learning can be maximized and sustained, enhancing the learning outcome by fueling the students' motivation through reinforcement. When students have a greater sense of self-efficacy combined with motivation, it can result in a higher academic outcome.

3. Difference between Groups in Motivation, Self–efficacy, and Academic Achievement

Table 5
Test of Difference between Groups in Motivation, Self–efficacy, and Academic Achievement (Paired)

Compared Groups	Motivation (P value)	Significance	Self-efficacy (P value)	Significance	Academic Achievement (P value)	Significance
Treated Group Pretest vs. Posttest	0.0	Significant	0.0	Significant	0.0	Significant
Control Group Pretest vs. Posttest	0.0	Significant	0.14	Not Significant	0.0	Significant

The frequency of the scaled responses during the pre-test showed that the treatment group registered ten reactions under the Likert scale response category of 5, described as highly motivated. In contrast, the control group posted a relatively lower number of frequencies, computed at nine responses for the same Likert scale response described as with very highly motivated.

It indicates that during the pre-test, students' motivation level was slightly higher in the treated group than in the control group, and the difference is significant.

Moreover, during the pretest, both treated and control groups had a median of 4, meaning that half of the respondents gave ratings below 4, and the other half gave ratings above 4. It specifies that 50% of the respondents have favorable opinions.

However, after implementing the OCL-STAD method, the frequency of scaled responses registered seventeen. A higher Likert scale

ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

category of very highly motivated was observed for the treated group than the control group, with a frequency of thirteen responses.

It means that during the post-test, students' motivation level is higher in the treated group than in the control group, and the difference is significant.

In addition, during the pre-test, the treated and the control groups had a median of 4. Half of the respondents gave ratings below 4, and the other half gave above 4. It specifies that 50% of the respondents have favorable opinions.

Meanwhile, the frequency of the scaled responses during the pretest in the self-efficacy showed that the treatment group registered a total of eight (8) responses under the Likert scale response category of 5, described as very highly confident. In contrast, the control group posted a relatively lower number of frequencies computed at seven (7) responses for the same Likert scale response described as very highly motivated.

It indicates that during the pre-test, students' self-efficacy level is slightly higher in the treated group than in the control group, and the difference is significant.

Further, the treated group has a median of 3 which means that half of the sample gave ratings below 3, and the other half gave ratings above 3. It specifies that 50% of the respondents have neutral to agree on opinions. Meanwhile, the median of the responses for the control group was 4, which means that half of the respondents gave ratings below 4, and the other half gave ratings above four 4. It specifies that 50% of the respondents have favorable opinions.

However, after implementing the OCL-STAD method, the frequency of scaled responses registered a total of seventeen, with a higher Likert scale category of very highly confident observed for the treated group than the control group, with a frequency of eleven responses.

It indicates that after implementing the OCL-STAD method, the level of self-efficacy is higher in the treated group than in the control group, and the difference is significant.

Additionally, the responses for both the treated and the control group have a median of 4, meaning that half of the respondents gave ratings below 4, and the other half gave ratings above 4.

It specifies that 50% of the respondents have positive opinions.

Similarly, the frequency of the scores during the pretest in the academic achievement revealed that the treatment group registered a total of twenty-four students having a raw score of greater than twenty-five and a mean of 20.27. In contrast, the control group posted a relatively lower number of frequencies, having twenty-two students with the same average raw score with a mean of 19.37.

It indicates that during the pre-test, students' academic achievement level is slightly higher in the control group than in the treatment group.

However, after implementing the OCL-STAD method, the frequency of the scores registered a total of forty-five students having a raw score of greater than twenty-five and a mean of 38. At the same time, the control group posted a lower number of frequencies computed at thirty-four with the same average raw score with a mean of 31.77.

It shows that during the post-test, students' academic achievement level was significantly higher in the treated group than in the control group.

Table 6
Frequency Table of Motivation, Self-Efficacy, and Academic Achievement of Students in both Groups

		Motivation						Self-efficacy						Academic Achievement		
		Frequency (f)					Median	Frequency (f)					Median	Frequency of Scores		Mean
		1	2	3	4	5		1	2	3	4	5		<25	>25	
Treated Group (OCL STAD Method)	Pretest	1	7	14	12	10	4	1	10	18	9	8	3	21	24	20.27
	Post-test	0	1	8	19	17	4	0	0	8	20	17	4	0	45	38
Control Group (Regular Online)	Pretest	1	6	14	15	9	4	0	5	17	17	7	4	23	22	19.37
	Post-test	0	3	11	18	13	4	0	4	12	17	11	4	11	34	31.77

Degree of motivation and self–efficacy in a five-point Likert Scale: (5) – Very High; (4) – High; (3) - Moderate; (2) – Low; (1) – Very Low

4. Relationship among Motivation, Self-Efficacy, and Academic Achievement under the Regular Online Classroom Instruction
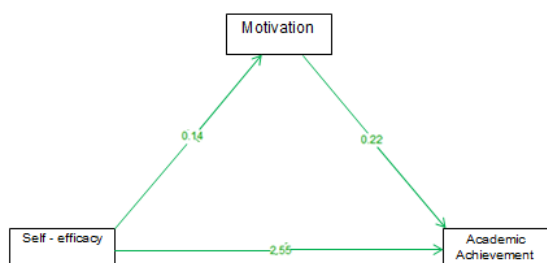
Figure 1. Path Diagram of Self-Efficacy, Motivation, and Academic Achievement under Regular Online Classroom

Figure 2. Path Diagram of Self-efficacy, Motivation, and Academic Achievement under the OCL-STAD Method

Self-efficacy significantly influences academic achievement, with a path coefficient of 2.55. Also, self-efficacy directly affects motivation, with a path coefficient of 0.14. In contrast, motivation has a lesser direct effect on students' academic achievement, as shown by the path coefficient of 0.22. Further, the mediation of self-efficacy to motivation has a lesser impact on academic achievement.

It indicates that self-efficacy, rather than motivation, is the antecedent of academic achievement in regular online classroom instruction.

It was revealed that with regular online classroom instruction, self-efficacy's direct effect on academic achievement is much higher than its indirect effect as mediated by motivation. Also, the impact of motivation on academic achievement is feeble. It is because students work individually in regular online classroom instruction, catering to self-efficacy and resulting in high academic performance. On the other hand, motivation was not modulated much by self-efficacy because cooperation and collaboration between peers were not observed. According to Yaduvanshi and Singh (2019), cooperation is needed for students to become more motivated and active to achieve higher academic outcomes.

5. **Relationship among Motivation, Self-Efficacy, and Academic Achievement under the OCL – STAD Method**
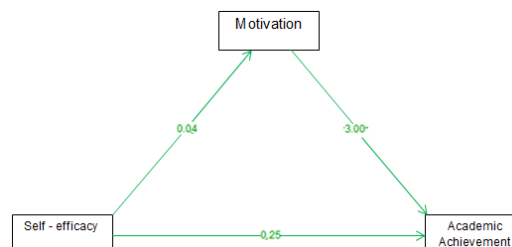
CONCLUSIONS

In summary, the OCL-STAD method was found to be more effective than the regular online classroom in improving academic achievement. The results indicated that the OCL-STAD method promotes motivation, self-efficacy, and academic achievement. As a cooperative learning experience, the OCL-STAD method can boost students' motivation through reinforcements and rewards.

Specifically, the results show that self-efficacy directly affects academic achievement and influences motivation. In the OCL–STAD method, the direct effect of self-efficacy and motivation on academic performance is very low compared to its indirect effect, as it mediates motivation. It means that when a student has the confidence to complete the learning tasks, added to motivation from peer reinforcement, it will result in better academic performance. Furthermore, this revealed that students' academic achievement is primarily affected as self-efficacy mediates motivation. It indicates that when self–efficacy is combined with motivation, high academic performance will be achieved. According to Vancouver and Kendall (2014), self-efficacy tends to have a positive role in motivation, ultimately affecting an individual's academic performance.

In conclusion, the findings demonstrated that the OCL-STAD method effectively enhances students' self-efficacy, motivation, and academic achievement.

RECOMMENDATIONS

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com
ONG, J.A.I.*, Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

19

Several recommendations are proposed to optimize online teaching and improve students' academic performance. Firstly, it is recommended to employ the Online Cooperative Learning (OCL) utilizing the Student Teams Achievement Divisions (STAD) method specifically for teaching complex topics in Biology. This method has demonstrated effectiveness in enhancing motivation, self-efficacy, and academic achievement, making it suitable for facilitating deeper understanding and engagement with intricate subject matter.

Moreover, extending the use of the OCL-STAD method to other subjects in online education is advised. By incorporating this collaborative learning approach across various disciplines, educators can promote interactive learning experiences and foster a supportive peer environment conducive to academic success. Furthermore, it is essential to provide comprehensive training to teachers on the STAD method. Equipping educators with the necessary skills and knowledge to implement cooperative learning strategies will empower them to create dynamic and effective learning environments that cater to students' diverse learning needs.

Lastly, there is a recommendation for educational institutions such as the Department of Education to organize workshops focused on cooperative learning methodologies. These workshops would serve as valuable platforms for educators to exchange best practices, gain insights into innovative teaching strategies, and ultimately enhance the academic performance of secondary school students in online learning settings.

REFERENCES

Adams, D. & Hamm, M. (1996). Cooperative learning: Critical thinking and collaboration across the curriculum. (Second Edition). *Charles C. Thomas, Publishers, 2600 South First Street, Springfield, IL 62794-9265.* https://eric.ed.gov/?id=ED395717

Ari, D., & Sadi, Ö. (2019). Effectiveness of cooperative learning on students' achievement in genetics, self-efficacy, and conceptions of learning biology. I.E.: Inquiry in Education, 11(2), 4.

Doymus, K., Koc, Y., & Okumus, S. (2019). Determining the effect of cooperative learning and models on the conceptual understanding of the chemical reactions. *Educational Policy Analysis and Strategic Research, 14(3), 154-177.*https://eric.ed.gov/?id=EJ1232143

Gambarı, A. I., & Yusuf, M. O. (2015). Malaysian effectiveness of computer-assisted STAD cooperative learning strategy on Physics problem solving, achievement and retention. *Malaysian Online Journal of Educational Technology.* www.mojet.net

Gupta, M., Jain, M., & Pasrija, P. (2014). Gender related effects of co-operative learning strategies (STAD And Tai) on Mathematics achievement. *Issues and Ideas in Education*, Chitkara University Publications, India. https://iie.chitkara.edu.in/index.php/iie/article/view/128

Holubec, E. (1992). How do you get there from here: Getting started with cooperative learning. *Contemporary Education.* https://www.proquest.com/openview/1db40139cb4e308d987834e355349a5a/1?pq-origsite=gscholar&cbl=1816594

Jacobs, G. (2016). Ten strengths of how teachers do cooperative learning. *Journal on Applied Linguistics and Language Education.* http://journal.wima.ac.id/index.php/BW/article/view/813/0

Johnson, D. (1986). Mainstreaming and cooperative learning strategies. *American Psychological Association.* https://psycnet.apa.org/record/1986-20774-001

Johnson, D., Johnson, R., & Mary Beth, S. (1989). Impact of goal and resource interdependence on problem-solving success. *The Journal of Social Psychology.* https://www.tandfonline.com/doi/abs/10.1080/00224545.1989.9713780

Johnson, D., Johnson, R., Roseth, C., & Seob, S. (2014). The relationship between motivation and achievement in interdependent situations. *Journal of Applied Social Psychology*. https://onlinelibrary.wiley.com/doi/abs/10.1111/jasp.12280

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com
ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

20

Johnson, R., & Johnson, D. (1999). What makes cooperative learning work. *Opinion Papers (120).* https://eric.ed.gov/?id=ED437841

Karaçöp, A. (2016). Effects of student teams-achievement divisions cooperative learning with models on students' understanding of electrochemical cells. *International Education Studies*, *9*(11), 104-120. https://files.eric.ed.gov/fulltext/EJ1118579.pdf

Khan, G. N., & Inamullah, H. M. (2011). Effect of student's team achievement division (STAD) on academic achievement of students. *Asian Social Science.* https://pdfs.semanticscholar.org/b517/88435d993a54b4807c16696402b6b00a2898.pdf

Lantajo, J., & Tipolo, R. (2018). Student-team achievement division (STAD) and its effect on the academic performance of Grade 8 students. *Journal of Physics.* https://iopscience.iop.org/article/10.1088/1742-6596/1254/1/012014/meta

Law, Y. (2008). Effects of cooperative learning on second graders' learning from text. *International Journal of Experimental Educational Psychology.* https://www.tandfonline.com/doi/abs/10.1080/01443410701880159

Li, M. P., & Lam, B. H. (n.d.). Cooperative learning. *Active Classroom. The Hong Kong Institute of Education.* https://www.eduhk.hk/aclass/Theories/cooperativelearningcoursewriting_LBH%2024June.pdf

Ling, W. N., Ghazali, M. I. B., & Raman, A. (2016). The effectiveness of student teams-achievement division (STAD) cooperative learning on mathematics achievement among school students in Sarikei District, Sarawak. *International Journal of Advanced*

Molla, E. (2018). Impact of cooperative learning approaches on students' academic achievement and laboratory proficiency in Biology subject in selected rural schools, Ethiopia. *Hindawi Educational Research International.* https://www.hindawi.com/journals/edri/2018/6202484/

Mundy, M. A., Kupczynski, L., Goswami, J., & Meling, V. (2012). Cooperative learning in distance learning: A mixed methods study. *International Journal of*

Instruction Vol.5, No.2. https://eric.ed.gov/?id=ED533785

Nair, S. M., & Sanai, M. (2018). Effects of utilizing the STAD method (cooperative learning approach) in enhancing students' descriptive writing skills. *International Journal of Education and Practice, Vol. 6., No. 4., pp.239-252.* https://eric.ed.gov/?id=EJ1209965

Nichols, J., & Hall, N. (October). The effects of cooperative learning on student achievement and motivation in a high school geometry class. *Elsevier Science Direct.* https://www.sciencedirect.com/science/article/abs/pii/S0361476X96900314

Ning, H., & Hornby, G. (2014). The impact of cooperative learning on tertiary EFL learners' motivation. *Educational Review, 66:1, 108-124.* https://www.tandfonline.com/doi/abs/10.1080/00131911.2013.853169

Panitz, T. (1999). Collaborative versus cooperative learning: A comparison of the two concepts which will help us understand the underlying nature of interactive learning*. Opinion Paper.* https://eric.ed.gov/?id=ED448443

Polat, M., Keskin, F., & Bolukbas, F. (n.d.). The effectiveness of cooperative learning on the reading comprehension skills in Turkish as a foreign language. *Turkish Online Journal of Educational Technology, 10*(4), 330-335. https://eric.ed.gov/?id=EJ946641

Prananda, G., & Hadiyanto, H. (2019). The effect of cooperative learning models of STAD type on Class V Science learning. *Educational Journal of Educational Dynamics.* http://ijeds.ppj.unp.ac.id/index.php/IJEDS/article/view/119

Pugach, M. (1995). Collaborative practitioners, collaborative schools. *Love Publishing Company, 1777 South Bellaire St., Denver, CO 80222.* https://eric.ed.gov/?id=ED378777

Rattanatumma, T., & Puncreobutr, V. (2016). Assessing the effectiveness of STAD model and problem-based learning in Mathematics learning achievement and problem-solving ability. *Journal of*

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com

ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

21

Education and Practice, Vol.7, No.12. https://eric.ed.gov/?id=EJ1099565

Rotas, E. & Cahapay, M. (2020). *Difficulties in remote learning: Voices of Philippine university students in the wake of COVID-19 crisis. Journal of Distance Education.* https://files.eric.ed.gov/fulltext/EJ1285295.pdf

Seda, O., Koc, Y., & Doymus, K. (2019). Determining the effect of cooperative learning and models on the conceptual understanding of the chemical reactions. *Educational Policy Analysis and Strategic Research, 14:3* https://eric.ed.gov/?id=EJ1232143

Sjafei, I. (2021). STAD-type cooperative learning design to develop student online learning activities. *International Journal of Education, Information Technology, and Others.* http://jurnal.peneliti.net/index.php/IJEIT/article/view/808

Slavin, R. (1987). *Cooperative learning and the cooperative school.* Association for Supervision and Curriculum Development. https://files.eric.ed.gov/fulltext/ED342108.pdf#page=11

Slavin, R. (1991). *Student team learning: A practical guide to cooperative learning. (3rd ed.).* National Education Association.. https://eric.ed.gov/?id=ED339518

Syakur, A., Junining, E., & Sabat, Y. (2020). The effectiveness of coopertative learning (STAD and PBL type) on e-learning sustainable development in higher education. *Journal of Development Research*http://www.journal.unublitar.ac.id/jdr/index.php/jdr/article/view/98

Teemuangsai, S., & Tiantong, M. (2013). Student team achievement divisions (STAD) technique through the Moodle to enhance learning achievement. *International Education Studies; Vol. 6, No. 4;.* https://eric.ed.gov/?id=EJ1067595

Torres, P. L., Gonzales, W., & Wong, D. (2016). Filipino ESL learners' attitudes toward cooperative learning and their relationship to reading comprehension. *TESOL International Journal 70.* https://eric.ed.gov/?id=EJ1251270

Tran, V. D. (2014). The effects of cooperative learning on the academic achievement and knowledge retention. *International Journal of Higher Education Vol. 3, No. 2.* https://eric.ed.gov/?id=EJ1067568

Vancouver, K. (2014). When self-efficacy negatively relates to motivation and performance in a learning context. *J Appl Psychol. 2006 Sep;91(5):1146-53.* https://pubmed.ncbi.nlm.nih.gov/16953775/

Wurijanto, T., & Hariadi, B. (2016). Influence of web-based cooperative learning strategy and achiever motivation on student study outcome. *International Journal of Evaluation and Research in Education (IJERE) Vol.5, No.3.* https://eric.ed.gov/?id=EJ1115394

Wadsworth, B. J. (1996). *Piaget's theory of cognitive and affective development: Foundations of constructivism* (5th ed.). Longman Publishing

Yaduvanshi, S., & Singh, S. (2019). Fostering achievement of low-, average-, and high-achievers students in Biology through structured cooperative learning (STAD method). *HINDAWI Educational Research International.* https://www.hindawi.com/journals/edri/2019/1462179/

AUTHOR'S PROFILE

Jo Angeli Ipo Ong, MaEd, finished Bachelor of Secondary Education major in Physics at Bicol State College of Applied Science and Technology formerly CSPC-Naga Campus, and Master of Arts in Education major in Science at Partido State University. At present, she is a Teacher III at Ocampo National High School for twelve years teaching Science 10 and Research IV. Her research includes the effects of Online Cooperative Learning using Student Teams Achievement Divisions (STAD) Method to the Motivation, Self-efficacy, and Academic Achievement of Students in Science 10.

COPYRIGHTS

P – ISSN 2651 - 7701 | E – ISSN 2651 – 771X | www.ioer-imrj.com
ONG, J.A.I*., Effects of Online Cooperative Learning (OCL) using Student Teams Achievement Division (STAD) Method to the Motivation, Self -Efficacy, and Academic Achievement of Students in Science 10, pp.13 - 22*

22