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The Effectiveness of the Dynamic Learning Program (DLP) on Students' Science Process Skills among 7-Grade Students

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Abstract

This study looks into the effect of the Dynamic Learning Program (DLP) through the use of a Learning Activity Sheet in improving the science process skills of Grade 7 students in a rural secondary school in the Philippines. A mixed-method quasi-experimental design was utilised, with 47 students in each group, the experimental group exposed to the DLP and a control group following traditional teaching methods. Pre-tests and post-tests measured students' proficiency in the science process skills (SPS): observing, classifying, communicating, measuring, inferring, experimenting, and predicting. Results showed that the experimental group demonstrated significant improvements in classification, communication, and measurement skills, while other skills, such as observation and experimentation, showed minimal to no improvements. The thematic analysis of reflective journals shows positive student perceptions of the Learning Activity Sheets (LAS) used in the DLP, emphasising the ease of use, increased engagement during class, and a sense of responsibility in learning. Students in the experimental group expressed a preference for LAS over traditional notebooks, citing the structured format and the clear, task-oriented approach that promoted independent learning. Although there are some limitations in terms of SPS improvement, the study concludes that DLP is an effective strategy for enhancing science process skills, particularly in schools with very limited resources. It was further recommended that future research focus on optimising DLP to improve skills such as observation, inference, and experimentation.

Keywords: Dynamic learning program, science process skills, learning activity sheets

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INTRODUCTION

Science Process Skills (SPS) are fundamental in learning science subjects. This refers to essential abilities that individuals use in everyday life to become scientifically literate and comprehend the nature of science. These skills include observation, communication, classification, measurement, inference, and prediction. They enable individuals to conduct investigations, draw conclusions based on evidence, and evaluate the usefulness of data in answering research questions (Barman, 1992).

One of the main aims of secondary science education is to equip students with science process skills so they can identify problems, observe societal events, analyse and hypothesise solutions, and apply information to benefit their communities (Derilo, 2019; Aktamis & Ergin, 2008). For students to succeed in higher-order thinking, science inquiry and hands-on activities, they must master these skills, which are categorised into basic and integrated skills (Batisla-Ong, 2021; Maranan, 2017).

The emphasis on developing science process skills in secondary education is particularly important in the Philippines, where recent assessments have highlighted the need for improvements in educational quality. The quality of education in the Philippines came under scrutiny in 2019 due to local and international assessments revealing the low performance of Filipino learners (Malipot, 2019). This result is disheartening; however, this can be viewed as an opportunity for education stakeholders to unite in providing quality education for all. Teachers play a pivotal role in this effort, but innovative teaching methods are essential for effective learning (Schleicher, 2017). There are a lot of innovative teaching methods being introduced, including the CVIF-DLP or the Dynamic Learning Program.

The Dynamic Learning Program (DLP) is an innovative, activity-based, and multidomain approach to education designed to enhance student engagement and independent learning (Cadag, 2023; Rosales, 2023). Developed by Dr. Christopher Bernido and Dr. Ma. Victoria Carpio-Bernido in the Philippines, the DLP was first implemented at the Central Visayan Institute Foundation (CVIF) in Jagna, Bohol. This program was initially created to address the challenges faced by the Philippine educational system, particularly in resource-constrained areas.

Unlike traditional teaching methods, which often rely heavily on teacher-centred instruction, the DLP encourages students to take charge of their learning process (Delos Reyes & Torio, 2021). Through structured activities and concept notes, learners are required to understand lessons and complete exercises independently before the teacher formally discusses the material (Fisher & Fray, 2021). This shift in responsibility transforms the teacher's role into that of a facilitator, guiding students as they apply the knowledge they have gained on their own. The program also emphasises critical thinking and problem-solving skills. By engaging actively with the material through self-directed tasks, students develop the ability to analyse, synthesise, and evaluate information, promoting deeper comprehension of scientific concepts.

There are already several researchers, including the founder of the CVIF-DLP, have proven the effectiveness of the DLP in enhancing academic achievement (Fabunan & Rodriguez, 2024; Cadag, 2023; Soria et al., 2023; Delos Reyes & Torio, 2021; Bernido & Bernido, 2020). However, no studies have correlated or looked into its effect on the improvement of students' science process skills.

DLP fosters a sense of responsibility in learners, empowering them to become more self-reliant. This not only improves their grasp of the subject matter but also equips them with skills necessary for lifelong learning (Capioso & Lapada, 2024). By fostering critical thinking and problem-solving skills, DLP supports the development of science process skills, enabling students to apply their knowledge and abilities to real-world scientific challenges (Fabunan & Rodriguez, 2024). This approach would be best implemented in a rural secondary high school in the Philippines. Thus, this study will look into the effectiveness of the Dynamic Learning Program in improving the Science Process Skills of Grade 7 Learners.

METHODS

This study utilised the Quanti-Quali Mixed-Method Design to answer the problems. The first part of the study used the quantitative design, specifically a quasi-experimental approach, where the Grade 7 learners were the respondents, and they were divided into two groups known as the Experimental and Control Groups.

The respondents were selected from the 7th grade heterogeneous classes, consisting of a very satisfactory (89-85) to fairly satisfactory (75-79) grade point average. Random selection was used to determine which section would be the experimental and the control group. One section with 47 students was randomly selected for the Dynamic Learning

Program as their teaching approach, or the experimental group, and the other section would be exposed to the conventional method of teaching or the control group.

Table 1. Respondents Sampling Frame

Grade 7 – Jose Rizal	**Male**	**Female**	**Total**
(Experimental Group)	25	22	47
Grade 7 – Andres Bonifacio	**Male**	**Female**	**Total**
(Control Group)	29	18	47

A standardised tool from the Department of Education's Alternative Delivery Mode (2020) was used to evaluate the effectiveness of the Dynamic Learning Program (DLP) on the science process skills of the Grade 7 students. Modifications were made to fit the study's needs. Pre-test and post-test questionnaires, adapted from DepEd's self-learning modules, assessed seven science process skills: observing, inferring, measuring, communicating, classifying, experimenting, and predicting. Learning Activity Sheets (LAS) were provided for student activities and assessments. These materials, including pre-tests and presentations, were evaluated by experts and designed for various instructional modalities like blended face-to-face and modular learning.

The researcher first sought permission from the school head of Rito Monte De Ramos Sr. Memorial Nahaong National High School to conduct the study. An orientation on the use of Learning Activity Sheets (LAS) and the Dynamic Learning Program (DLP) was provided to the experimental group. A pre-test was administered to both experimental and control groups before DLP implementation. The experimental group received daily LAS, where they completed notes, activities, and exercises, followed by a brief teacher-led lesson. The LAS was checked, recorded, and returned to students for compilation. Throughout the third quarter, the experimental group used LAS as their primary material, while the control group followed traditional instruction. The third quarter ran for around 2 months. A post-test was conducted for both groups at the end of the quarter. Respondents completed the questionnaires either online or in person and were guided on how the seven basic science process skills impacted their learning.

The data gathered in the pretest and posttest of both the experimental and controlled groups were analysed using the t-test, which determined that some results had a significant effect and others had no significant effect after the intervention. The same data was run using the t-test for some science process skills, such as the observation that there was a significant difference in the pretest only. The researcher required the students to answer five questions in their reflective journals individually. The learners' responses are converted into English since they can express themselves more using the vernacular. Thematic analysis was used to analyse the reflective journals of the experimental group, and the major themes emerged and were discussed to augment the result of the quantitative hypothesis testing.

RESULTS & DISCUSSION

As shown in Table 2, the level of achievements of the experimental group and the controlled group, both on the pre-test and post-test, is based on their basic science skills. The table groups the skills into science process skills and divides the learners into a control group and an experimental group. The table shows the results of a pre-test and a post-test for each group. Results of the study revealed that science process skills improved in the students of the experimental group after DLP intervention was used as the main tool. The group scored an average of 1.95 in observation in the pre-test, which slightly increased to

1.98 in the post-test. The classification mean rose from 2.02 to 2.81, with a significant improvement to a 'good' level. A similar increase in description raised communication skills from 2.14 to 2.88. Mastery of vocabulary increased from 1.05 to 2.68, and measurement skills improved with a score increase from 1.05 to 1.76, moving from 'poor' to 'fair.' Inference skills increased from 1.35 to 1.79, also shifting from 'fair' to 'good.' While experiment (0.14) and prediction skills (0.12) showed minor increases, their overall description remained 'fair.'

Table 2. Level of Achievement of Grade 7 Learners Based on the Basic Science Skills

Science Process Skill	**Group**	**Pre-Test**		**Desc.**	**Post-Test**		**Desc.**
		mean	St.dev		mean	St.dev	
Observation	Control	1.19	0.85	Fair	1.71	1.07	Fair
	Experimental	1.95	1.02	Fair	1.98	1.80	Fair
Classification	Control	1.60	1.32	Fair	2.17	1.10	Fair
	Experimental	2.02	1.21	Fair	2.81	1.13	Good
Communication	Control	2.32	1.42	Fair	2.06	1.06	Fair
	Experimental	2.14	1.44	Fair	2.88	1.25	Good
Measurement	Control	1.00	0.82	Poor	1.60	0.91	Poor
	Experimental	1.05	1.02	Poor	1.76	1.30	Fair
Inference	Control	1.16	0.82	Fair	1.11	1.02	Fair
	Experimental	1.35	1.00	Fair	1.79	0.93	Good
Experiment	Control	0.97	0.80	Fair	0.80	0.72	Poor
	Experimental	0.77	0.72	Fair	0.91	0.79	Fair
Prediction	Control	2.24	1.52	Fair	2.34	1.11	Fair
	Experimental	1.98	1.85	Fair	2.10	1.23	Fair

In contrast, the control group, which did not receive the DLP intervention, showed no significant improvements, with some skills like experimentation even declining from 'fair' to 'poor.' Most of the control group's skills were rated as 'fair' or 'poor.' The data suggest that DLP-Learning Activity Sheets are effective in improving science process skills among students exposed to the program compared to those who were not. Dynamic Learning Program had a positive effect on the science process skills of the experimental group. They have shown improvement in their science process skills, particularly in classification, communication, measurement and inference and least in observation.

The experimental group consistently demonstrates higher improvements in most of the science process skills, particularly in classification, communication, and inference. The control group, however, shows better performance in observation and modest gains in measurement and prediction. Communication skills show the largest disparity, with the control group regressing while the experimental group improved substantially. This suggests that the experimental intervention was more effective overall in enhancing science process skills, with specific areas of strength depending on the type of skill being looked into.

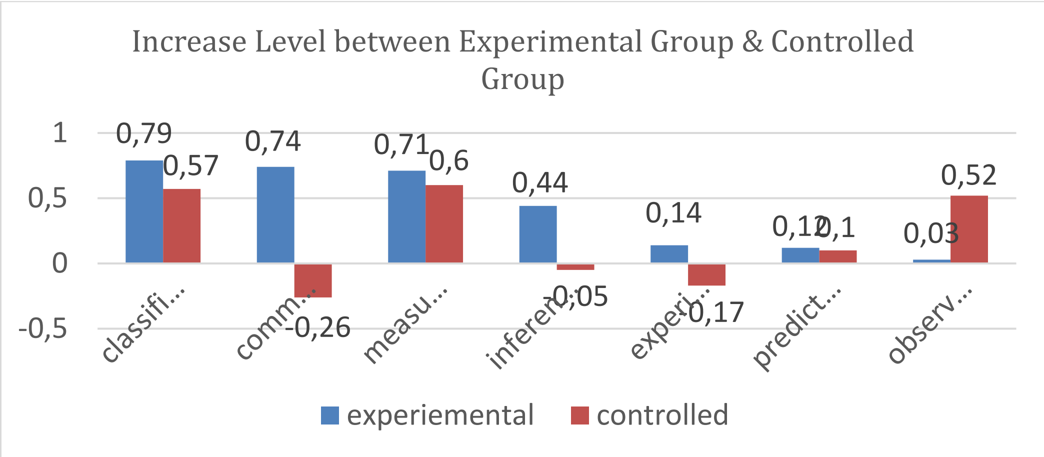

Figure 1. Increase the level between the experimental group and the control group

Table 3. Significant Difference in the Level of Science Process Skills Before and After the Implementation of Dynamic Learning Approaches in Teaching and Learning

Science Process Skill	**Pre-Test**		**Post-Test**		**Mean Difference**	**T-test**	**F-test**	**P-value**	**Description**
	mean	sd	mean	sd					
Observation	1.60	1.01	1.86	1.13	-0.257		0.30	0.584	Not Significant
Classification	1.83	1.27	2.32	1.12	-0.500	-2.61		0.010	Significant
Communication	2.23	1.42	2.51	1.23	-0.281	-1.32		0.188	Not Significant
Measurement	1.03	0.93	1.69	1.14	-0.663	-4.01		0.000	Significant
Inference	1.25	0.92	1.48	1.02	-0.231	-1.49		0.139	Not Significant
Experiment	0.86	0.76	0.86	0.76	0.005	0.04		0.965	Not Significant
Prediction	2.10	1.35	2.21	1.17	-0.108	-0.53		0.594	Not Significant

Significant improvements were noted in classification and measurement skills. The post-test mean scores for classification increased significantly (from 1.83 to 2.32, $p = 0.010$), indicating that the Dynamic Learning Approaches effectively enhanced students' ability to classify information. This finding aligns with previous research suggesting that active learning strategies, which involve categorising and organising information, can significantly boost cognitive processing in learners (Lombardi et al., 2021). Similarly, the measurement skill showed a notable improvement (from 1.03 to 1.69, $p = 0.000$), which suggests that hands-on, experiential learning approaches incorporated in the Dynamic Learning method are particularly effective in improving students' ability to take accurate measurements (Gonzales & Villaruel,2024). This could be attributed to the practice-oriented nature of the approach, which aligns well with practical skills like measurement.

On the other hand, the results indicate no significant improvement in other key science process skills, including observation ($p = 0.584$), communication ($p = 0.188$), inference ($p = 0.139$), experiment ($p = 0.965$), and prediction ($p = 0.594$). Despite the slight increases in mean scores for observation, communication, and inference, the differences were not statistically significant. These findings suggest that while Dynamic Learning

Approaches may provide certain benefits, their influence on these specific skills is limited in the short term (Cadag, 2023).

One potential explanation for the lack of significant improvement in observation and inference could be the nature of the Dynamic Learning activities used in this study, which may not have emphasised detailed observational practice or critical thinking required for making inferences. Similarly, the absence of improvement in communication and prediction skills could indicate that these areas require more structured and targeted interventions, such as collaborative discussions or predictive reasoning exercises, which may not have been adequately integrated into the learning activities.

Furthermore, the unchanged performance in experiment skills ($p = 0.965$) suggests that simply engaging students in dynamic activities may not be sufficient to improve their ability to design and conduct experiments. This might imply that more explicit instruction and scaffolding in experimental design and hypothesis testing are needed to foster growth in this area.

Students Perceived the Effects of DLP on their Science Process Skills

The thematic analysis conducted in this study identified five major themes regarding students' preferences and experiences with the DLP through the use of the learning activity sheets (LAS) as compared to the conventional methods.

The analysis revealed a strong preference for LAS due to their convenience, ease of use, and ample writing space, which students found more engaging and motivating. These findings are consistent with Qureshi et al. (2023), who highlighted the positive impact of interactive learning methods on student engagement and skill development. Students frequently expressed that LAS allowed for quicker and easier completion of tasks compared to notebooks. They emphasised that LAS were easier to organise and less likely to be lost, further enhancing their preference. Additionally, students appreciated the structured format and specific activities in the LAS, which were aligned with the Dynamic Learning Program (DLP), making lessons more understandable and easier to complete.

Students reported significant improvements in both reading and writing skills, which were directly linked to their use of LAS. Specifically, they noticed faster reading speeds, better handwriting, and enhanced cognitive development. The structured nature of LAS allowed for consistent practice and feedback, which contributed to the development of critical thinking skills. This aligns with Li et al. (2023), who found that structured learning activities promote higher-order thinking and cognitive growth. As students engaged in more frequent reading and writing tasks within the LAS, their literacy skills improved, contributing to a more comprehensive understanding of the material.

Another theme that emerged was the increased sense of responsibility and ownership among students who used LAS. The structured nature of the LAS, combined with the need to compile them into comprehensive portfolios, encouraged students to take greater responsibility for their learning materials. As Cooper et al. (2000) noted, fostering responsibility and ownership in learning activities correlates with improved academic performance. Students became more organised and took pride in their work, which, in turn, increased their motivation to complete tasks and participate in learning activities.

The analysis underscored the significance of motivation in task completion through LAS. Students were particularly motivated by the presence of examples within the LAS, which helped them understand complex tasks and boosted their confidence in completing exercises. This supports Hidi and Renninger's (2006) findings that examples enhance motivation by providing clarity and reducing task complexity. Additionally, the structured nature of LAS activities, coupled with self-determined goals and external motivators like family encouragement, helped maintain students' perseverance and focus on academic tasks.

Finally, the study found that LAS positively influenced students' interest and engagement in learning. The simplified and organised presentation of information in LAS helped reduce cognitive load, making it easier for students to process and understand new concepts. This supports the findings by Mayer (2009) and Sweller (1988), who emphasised that reducing cognitive load enhances learning efficiency and comprehension. The interactive nature of LAS encouraged active participation, fostering the development of observational, communication, and collaborative skills essential for scientific inquiry (Hmelo-Silver, 2004). Moreover, LAS activities stimulated intrinsic motivation and curiosity, which Deci et al. (1991) argued are critical for deep engagement and exploration in learning.

From the students' reflection, it is evident that there is a positive acceptance among students who use learning activity sheets through the Dynamic Learning Program. It demonstrates a positive impact on students' science process skills.

CONCLUSION

The Dynamic Learning Program (DLP) implemented through Learning Activity Sheets (LAS) has a positive impact on the science process skills of Grade 7 students, particularly in areas such as classification, communication, measurement, and inference. While the program significantly improved certain skills, like classification and measurement, it did not yield statistically significant results for others, such as observation and experimentation. The study also highlighted that DLP fosters a sense of responsibility and self-reliance among students, contributing to their overall learning and development. However, further refinement of the program may be necessary to enhance skills such as observation, experimentation, and prediction. This study provides valuable insights for educators, emphasising the need for innovative teaching strategies like DLP to improve educational outcomes in science, particularly in rural settings. Future research could explore long-term effects and the integration of additional interventions to support areas of improvement.

REFERENCES

Alforte, M. K., Anlocotan, R., Bernales, L.F., & Mendes, N. R. (2018). "Effects of the Implementation of Dynamic Learning Program to the Academic Performance of Grade 12 Students of SWU – PHINMA

Aktamis, H., & Ergin, Ö. (2008, June). The effect of scientific process skills education on students' scientific creativity, science attitudes and academic achievements. In *Asia-Pacific forum on science learning and teaching* (Vol. 9, No. 1, pp. 1-21). The Education University of Hong Kong, Department of Science and Environmental Studies.

Apaivatin, R. (2021). Research Synthesis of STEM Education effected on science process skills in Thailand. Journal of Physics Conference Series 1835. DOI: 10.1088/1742-6596/1835/1/012087

Asio, J. M. & Mondejar, H. C. (2022). Students' Level of Science Process Skills Acquisition and Academic Achievement During the Pandemic. Central Mindanao University-Journal of Science. DOI: https://doi.org/10.52751/qw50j602

Barman, C. R., & Shedd, J. D. (1992). An in-service program designed to introduce K-6 teachers to the learning cycle teaching approach. *Journal of Science Teacher Education*, *3*(2), 58–64.

Batisla-Ong, S. N. (2021). Science process skills and academic achievement of grade 10 STE students in the 4th District of Iloilo. *Science Asia Review*, *15*.

Bernido, C. C., & Bernido, M. V. (2020). Essentials Over Peripherals: The CVIF Dynamic Learning Program. In Anticipating and Preparing for Emerging Skills and Jobs: Key Issues, Concerns, and Prospects (pp. 67-76). Singapore: Springer Singapore. http://doi.org/10.1007/978-981-15-7018-6_9

Cadag, D. (2023). Strengths, Weaknesses, Opportunities, and Threats of CVIF-DLP Utilization in Selected Private Schools in the Division of Quezon. *Psychology and Education: A Multidisciplinary Journal*, *9*(6), 680–698.

Cooper, D. (2007). Opening up ownership: Community belonging, belongings, and the productive life of property. Law & Social Inquiry, 32(3), 625–664.https://doi.org/10.1111/j.1747-4469-2007.00072.x

Copioso, A., & Lapada, A. (2024). Dynamic Learning Program and Its Effect on Students' Mathematics Achievement. *Psychology and Education: A Multidisciplinary Journal*, *20*(9), 1168-1174.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. Educational psychologist, 26(3-4), 325-346. http://doi.org/10.1080/00461520.1991.9653137

Delos Reyes, R. D. G., & Torio, V. A. G. (2021). The relationship of expert teacher-learner rapport and learner autonomy in the CVIF-dynamic learning program. The Asia-Pacific Education Researcher,30(5),471-481. https://doi.org/10.1007/s40299-020-00532-y

Derilo, R. (2019). Basic and integrated science process skills acquisition and science achievement of seventh-grade learners. European Journal of Education Studies, 6(4), 1-181

Ely, L. L. (2019). Mastery learning of chemistry competencies through the spiral progression approach in curriculum. International Journal of Educational Science and Research (IJESR), 9(9), 28.

Evardo, M.A. (2023). Dynamic Learning Program; Perspective and Academic Performance. Eur. Chem. Bull. 2023, 12 (Special Issue 7), 5725 – 5729

Fisher, D., Frey, N., Smith, D., & Hattie, J. (2021). *Leading the rebound: 20+ must-dos to restart teaching and learning*. Corwin Press.

Fugarasti, H., Ramli, M., & Muzzazinah. (2019). Undergraduate students' science process skills: A systematic review. AIP Conference Proceedings. https://doi.org/10.1063/1.5139762

Gastar, J. M. E., & Linaugo, J. D. (2022). Acquisition of science process skills through alternative learning modalities among senior secondary school students. Philippine Social Science Journal,5(1),71-79.
https://doi.org/10.52006/main.v5i1.461

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? Educational psychology review, 16, 235-266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Howard, J. L., Gagné, M., Van den Broeck, A., Guay, F., Chatzisarantis, N., Ntoumanis, N., & Pelletier, L. G. (2020). A review and empirical comparison of motivation scoring methods: An application to self-determination theory. Motivation and Emotion, 44, 534-548. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Kusuma, A. E. (2021, December). Analysis of Science Process Skills for Senior High School Students in Banjarmasin. In 2nd International Conference on Innovation in Education and Pedagogy (ICIEP 2020) (pp. 11-16). Atlantis Press. DOI.10.2991/assehr.k.211219.003

Li, W., Huang, J. Y., Liu, C. Y., Tseng, J. C., & Wang, S. P. (2023). A study on the relationship between students 'learning engagements and higher-order thinking skills in programming learning. Thinking Skills and Creativity, 49, 101369. https://doi.org/10.1016/j.tsc.2023.101369

Llego, M. (2023). "On improving Teaching and Learning: Dynamic Learning Program (DLP) Can be The Key."

Maison D., Astalim, D. A. K., Peni, S. I, (2019). Science Process Skills and Motivation. Humanities & Social Sciences Reviews. Vol. 7, No. 5, 2019, pp 48-56. DOI: 10.18510/hssr.2019.756

Malipot, M. (2019). Year – End – Report: Deped 2019: The Quest for Quality Education Continuer Manila Bulletin _Admin.

Mayer, R. E. (2009). Constructivism as a theory of learning versus constructivism as a prescription for instruction. In Constructivist instruction (pp. 196–212). Routledge.

Miraña, A.E. (2019). Physics Content Knowledge of Junior High Schools in HEI-supervised and DepEd School in the Philippines. Asia Pacific Journal of Multidisciplinary Research, Vol. 7, No. 2, May, 2019 Part II

SEI-DOST & NISMED, (2011). Science framework for Philippine basic education. Manila: SEI-DOST & UP NISMED.

Noroña, R. V. (2021). A Comparative Analysis of the Status of Laboratory Resources And Science Process Skills of Grade 11 Learners in The Schools Division of Eastern Samar, Philippines. GNOSI: An Interdisciplinary Journal of Human Theory and Praxis, 4(3), 137-147.

Orongan, M. J. Q., & Nabua, E. B. (2020). A Causal Model for Psycho-social Aspects of Science Learning Environment on Academic Performance of Secondary School Students in Region X, Philippines. In Proceedings of the 3rd International Conference on Future of Education (Vol. 3, No. 1, pp. 77-92). DOI: https://doi.org/10.17501/26307413.2020.3108

Pungayan, K. (2018). Effects of the implementation of dynamic learning program to the academic effects of the implementation of Dynamic Learning Program to the academic.

Qureshi, M. A., Khaskheli, A., Qureshi, J. A., Raza, S. A., & Yousufi, S. Q. (2023). Factors affecting students' learning performance through collaborative learning and engagement. Interactive Learning Environments, 31(4), 2371–2391.
DOI:10.1080/10494820.2021.1884886

Renninger, K. A., & Hidi, S. (2011). Revisiting the conceptualisation, measurement, and generation of interest. Educational psychologist, 46(3), 168-184. http://doi.org/10.1080/00461520.2011.587723

Suman, S. (2017). "Developing Science Process Skills for Effective Science Learning. New Frontiers in Education (April-June, 2017). Vol. 50 Issue No. 2.

Sweller, J. (1988). Cognitive load during problem-solving: Effects on learning. Cognitive science, 12(2), 257–285. https://doi.org/10.1016/0364-0213(88)90023-7

Vicera, C. & Laude, A. (2016). Efficacy of the Secondary Education Development and Improvement Project (SEDIP) in Biliran Division, Philippines. IOSR Journal of Business and Management (OSSR-JBM). Volume 18, Issue 8. Ver. II, pp 65-68 DOI: 10.9790/487X-1808026568

Vitti, D., & Torres, A. (2006). Practicing science process skills at home. Retrieved on June 12, 2021.

Williams, M. K. (2017). John Dewey in the 21st century. Journal of Inquiry and Action in Education, 9(1), 7

Zeidan A., & Jayosi, M. R. (2015). Science Process Skills and Attributes towards Science among Palestinian Secondary School Students. World Journal of Education. Vol. 5, No. 1;2015. doi:10.5430/wje.v5n1p13

Zhou, J. (2020). "A Critical Discussion of Vygotsky and Bruner's Theory and their Contribution to Understanding of the way Students Learn. DOI: https://doi.org/10.30564/ret.v3i4.2444