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Development and validation of competency-based research I workbook for distance learning

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ABSTRACT

In a distance learning environment, the use of appropriate instructional material is an essential element of a successful teaching and learning process. Because of the pandemic, teachers were required to use the available learning resources to ensure learning continuity. In this paper, the main objective is to develop and validate instructional material that would assist teachers in delivering the lessons through a modular learning approach. A descriptive normative survey was utilized to determine the validity of the developed workbook for Research I. The results showed that the workbook met the prescribed requirements regarding adequacy, clarity, objectives, suitability, and usefulness. It was found to be adequate, clear, coherent, attainable, suitable, and useful for teachers and students as they discover learning through research. Thus, the workbook is recommended as instructional material in teaching the subject and promises a potential for a significant contribution to education and learning. Future research may also be explored, focusing on the effectiveness of the material developed

1. Introduction

Twenty-first century learners have diverse abilities and learning styles that are dependent on their learning environments, not only in school but also at home. On this note, teachers are expected to design instructional activities that cultivates maximum participation between and among teachers and learners. Because of the COVID 19 pandemic, teachers were left with no option but to shift from face-to-face classes to distance learning. The Philippines' Department of Education (DepEd) innovated and proposed programs that would assist teachers and learners in attaining the Most Essential Learning Competencies (MELC) which includes the DepEd Commons and the DepEd TV. Both of these innovations are dependent on mobile technologies and televisions which other students, especially in rural areas, don't possess. Thus, most teachers have used ready to print learning materials from the department. The gap between those learners who can afford online learning and those who can't is also observed [1], [2]. The current trend of education encourages teachers to become adaptive to innovations while considering students' diverse learning styles [3]. However, it is evident in distance learning delivery, numerous challenges are being faced by educators particularly in assessing students' learning both for online and modular learning modalities [4], [5], [6], [7], [8]. This is highly evident since learners are facing a hard time in coping with modular modality which contributed to a poor learning performance while some are due to readiness issues [9], [10], [11]. Thus, independent learning is highly encouraged especially for modular education where teacher's presence is unavailable. But learning independently was one of the significant challenges of learners in this current situation [12], [13]. Even though there are struggles in the implementation of modular learning modality, it was noted by researches that independent learning greatly supports constructivist and

student-centered approaches of instruction [14], [15], [16]. Modules had been used as effective instructional material not only for these reasons but also because of its potential for contextualization and localization which can be integrated in various field such as culture [17].

Despite of the struggles that the education sector is facing because of the pandemic, our educational leaders ensures that every child is at school and being educated to prevent illiteracy in all academic fields. To meet the demands of Education for All (EFA) [18], efforts are exerted to uplift the educational system with strong emphasis on the quality of the learning and instructional materials. DepEd is implementing various curriculum programs to cater to all inclinations and proclivities of students in different fields. It can be in sports, arts, science, mathematics and other specialized areas such as entrepreneurship and carpentry. Among these curriculum programs are the Science, Technology, and Engineering (STE) Program and Special Science Class (SSC) which are under the Special Science Program (SSP) of the Bureau of Curriculum Development [19]. These curricula focus firmly on the academic advancement of learners with high concentration in English, Mathematics, Science and Research. There are existing learning modules for these critical areas except Research. The development of such instructional materials had been consistently recommended to ensure that learners acquire the necessary 21st century skills [20]. Modules and workbooks are designed to bring about a satisfactory level of learning among the different intellectual levels. It provides learners opportunities for flexible mode of study and learning at their own pace [21], [22], [23]. Flexibility of learning is not only evident among students but also among teachers [24], [25]. With the current shift toward individualized programs in all educational levels, it has become imperative for the teacher to learn how to develop his instructional materials. Whether the instruction is intended for a whole class, or a student, the teacher should be able to plan, organize and develop suitable instructional materials. In this paper, a workbook was developed for Grade 7 Science, Technology and Engineering Program and Special Science Class students and Research teachers to meet the needs and demands of the 21st century learners and educators. Furthermore, this study aimed to help the students understand research in the simplest way possible. This is to encourage them to appreciate the importance and relevance of research in real life.

2. Method

Descriptive-normative survey method was utilized in determining the validity of the Competency-Based Research I Workbook. It was evaluated in terms of adequacy of activities, clarity of content, attainment of objectives, suitability, and usefulness. The respondents rated the responses for each indicator using the qualitative basis for interpretation of the results . The respondents' answers were converted into weights using the Likert 5-Point Scale. The equivalent weights of the descriptive interpretation were as follows: 5-Strongly Agree (SA), 4-Agree (A), 3-Fairly Disagree, 2-Disagree (D), and 1-Strongly Disagree (SD). Weighted mean and t-test for independent samples were used to analyze the data gathered. Weighted mean was used to determine the pooled evaluation of students and that of the teachers as to the characteristics of the workbook. On the other hand, a t-test for independent samples was utilized to compare the evaluation of students and teachers at a 0.05 level of significance. To determine the reliability and internal consistency of the perceptions of students and teachers, Cronbach's Reliability Test was used.

3. Results and Discussion

Table 1 shows that the teachers (WM = 4.65) and the students (WM = 4.49), strongly agreed and agreed on the adequacy of activities of the developed workbook, respectively. Specifically, both teachers and students strongly agreed on the following indicators: The tasks and activities can tap the creativeness and resourcefulness of the learners (WM = 4.73; WM = 4.63); and Learning activities are based on the contents of the curriculum guide (WM = 4.80; WM = 4.63). On the other hand, they both agreed that "The measurement tests (evaluation) are adequate to measure learner's performances" (WM = 4.40; WM = 4.30). Additionally, the teachers and the students strongly agreed and agreed on the following indicators, respectively: Manipulative activities are carefully designed to fit the level of the learners (WM = 4.60; WM = 4.43); The activities have real-world application and within the context of the learner (WM = 4.73; WM = 4.47). With an overall mean of 4.57 (Strongly Agree), this result implies that the teachers and students perceived that the activities presented in the

developed workbook are adequate. Furthermore, it can also be observed that Indicator 3 for Adequacy, "The measurement tests (evaluation) are adequate to measure learner's performances", has the lowest over-all mean of 4.35. This means that the respondents perceived that the measurement tests (evaluations) needs to be improved in terms of its appropriateness and adequacy.

Table 1. Perception of teachers and students on the adequacy of the developed workbook

Adequacy[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
The tasks and activities can the creativeness and resourcefulness of the learners.	4.73	SA	4.63	SA	4.68	SA
Manipulative activities are carefully designed to fit the level of the learners.	4.60	SA	4.43	A	4.53	SA
The measurement tests (evaluation) are adequate to measure learner's performances.	4.40	A	4.30	A	4.35	A
Learning activities are based on the contents of the curriculum guide.	4.80	SA	4.63	SA	4.72	SA
The activities have real world application and within the context of the learner.	4.73	SA	4.47	A	4.60	SA
Overall Weighted Mean	4.65	SA	4.49	A	4.57	SA

[a] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

Table 2 presents that the over-all mean perception of the teachers (WM = 4.72) and students (WM = 4.61) denotes that they both strongly agreed on the clarity of the developed workbook. Likewise, they both strongly agreed on the following indicators: The lessons are well organized to meet the level of the learners (WM = 4.80; WM = 4.67); The workbook is well designed to develop creativeness among the learners (WM = 4.73; WM = 4.57); The activities in the workbook promote maximum student participation (WM = 4.87; WM = 4.53); and The directions and instructions in the workbook are clear (WM = 4.53; WM = 4.57). On the other hand, the teachers strongly agreed (WM = 4.67) while the students agreed (WM = 4.43) that "The thought-provoking questions are clearly stated in each lesson". An overall weighted mean 4.67 (Strongly Agree) is presented. Thus, this implies that the teachers and students view the developed workbook as clear and precise. Moreover, it can be noted that Indicator 1 "The thought-provoking questions are clearly stated in each lesson", obtained the lowest over-all mean of 4.54. This means that though the respondents have "Strongly Agreed" to this indicator, still there is a need for improvement in the framing of set of questions used in the developed workbook.

Table 2. Perception of teachers and students on the clarity of the developed workbook

Clarity[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
The thought provoking questions are clearly stated in each lesson.	4.67	SA	4.40	A	4.54	SA
The lessons are well organized to meet the level of the learners.	4.80	SA	4.67	SA	4.74	SA
The workbook is well designed to develop creativeness among the learners.	4.73	SA	4.57	SA	4.65	SA
The activities in the workbook promote maximum student participation.	4.87	SA	4.53	SA	4.70	SA
The directions and instructions in the workbook are clear.	4.53	SA	4.87	SA	4.70	SA
Overall Weighted Mean	4.72	SA	4.61	SA	4.67	SA

[a] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

It is presented in Table 3 that both the teachers (WM = 4.73) and the students (WM = 4.66) strongly agreed on the content of the developed workbook. Specifically, they both strongly agreed on the following indicators: The topics are well-organized to meet the objectives (WM = 4.73; WM = 4.73); The activities are relevant to each lesson (WM = 4.73; WM = 4.67); The questions in each lesson are Higher Order Thinking Skills (HOTS) to enhance the learners' critical thinking (WM = 4.80; WM = 4.67); The exercises in each lesson develops the learners' ability to learn the subject independently (WM = 4.53; 4.57); and Contents correspond and are relevant to the descriptions and specifications of the curriculum guide (WM = 4.87; WM = 4.67). An over-all mean of 4.70 is also presented in the table. This means that the teachers and students perceived that the content of the developed workbook is aligned to the prescribed competencies. Moreover, it can be found that Indicator 4 "The exercises

in each lesson develops the learners' ability to learn the subject independently", has obtained the lowest over-all weighted mean of 4.55. This shows that, based on the assessment of the respondents, there is a need to enhance the exercises and activities presented in the developed workbook. Though, the respondents have "Strongly Agreed" in this indicator, still, exercises in the developed workbook should be improved in order to help the learners in learning the lessons independently.

Table 3. Perception of teachers and students on the content of the developed workbook

Content[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
The topics are well-organized to meet the objectives.	4.73	SA	4.73	SA	4.73	SA
The activities are relevant to each lesson.	4.73	SA	4.67	SA	4.70	SA
The questions in each lesson are Higher Order Thinking Skills (HOTS) to enhance the learners' critical thinking.	4.80	SA	4.67	SA	4.74	SA
The exercises in each lesson develops the learners' ability to learn the subject independently.	4.53	SA	4.57	SA	4.33	SA
Contents correspond and are relevant to the descriptions of the curriculum guide.	4.87	SA	4.67	SA	4.77	SA
Overall Weighted Mean	4.73	SA	4.66	SA	4.70	SA

[a] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

It is shown in Table 4 that both the faculty (WM = 4.89) and students (WM = 4.57) strongly agreed on the attainment of objectives of the developed workbook. In detail, they both strongly agreed on the following indicators: It is brief, clear and specific (WM = 4.93; WM = 4.67); It is significant to meet the learner's need (WM = 4.93; WM = 4.80); and It tends to measure the desired learning ability of the learners (WM = 4.87; WM = 4.66). On the other hand, they both agreed on the following: It is stated in the behavioral terms (WM = 4.93; WM = 4.47); and it is able to accomplish its projected learning targets as stated in the competencies (WM = 4.80; WM = 4.40). It is also presented that the over-all mean is 4.73 (Strongly Agree). This implies that the objectives presented in the developed workbook are attainable. Moreover, it can be noticed that Indicator 4 "It is able to accomplish its projected learning targets as stated in the competencies" has the lowest over-all mean rating of 4.60.

Table 4. Perception of teachers and students on the objectives of the developed workbook

Objectives[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
It is brief, clear and specific.	4.93	SA	4.67	SA	4.80	SA
It is stated in the behavioral terms.	4.93	SA	4.67	SA	4.70	SA
It is significant to meet the learner's need.	4.93	SA	4.67	SA	4.80	SA
It is able to accomplish its projected learning targets as stated in the competencies.	4.80	SA	4.40	A	4.60	SA
It tends to measure the desired learning ability of the learners.	4.87	SA	4.67	SA	4.77	SA
Overall Weighted Mean	4.89	SA	4.57	SA	4.73	SA

[a] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

Table 5 shows that both teachers (WM = 4.83) and students (WM = 4.93) strongly agreed on the suitability of the developed workbook. Specifically, they both strongly agreed on the following: The activities are suited to the level of the learners (WM = 4.87; WM = 4.93); The activities in every lesson are fitted to the ability of the learners (WM = 4.80; WM = 4.70); The lessons are presented in the correct sequence following the prescribed competencies based on the learners' level (WM = 4.87; WM = 4.60); The lessons reflect careful planning, selecting and designing of critical thinking and creativity among learners (WM = 4.73; WM = 4.83); and The workbook provides for the development of the learners (WM = 4.87; WM = 4.97). An overall mean of 4.82 is also shown.

These results denote that the teachers and students perceive that the developed workbook is suited to its target learners. Furthermore, it is presented in the table that Indicator 3 "The lessons are presented in the correct sequence following the prescribed competencies based on the learners' level" has obtained the lowest over-all mean of 4.74. Though the over-all mean denotes that the respondents "Strongly Agreed", sequence of lessons in the developed workbook should strictly follow the

prescribed order of the learning competencies. Perception of teachers and students on the suitability of the developed workbook.

Table 5. Perception of teachers and students on the suitability of the developed workbook

Suitability[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
The activities are suited to the level of the learners.	4.87	SA	4.93	SA	4.90	SA
The activities in every lesson are fitted to the ability of the learners.	4.80	SA	4.70	SA	4.75	SA
The lessons are presented in the correct sequence following the prescribed competencies based on the learners' level.	4.87	SA	4.80	SA	4.74	SA
The lessons reflect careful planning, selecting and designing of critical thinking and creativity among learners.	4.73	SA	4.83	SA	4.78	SA
The workbook provides for the development of the learners.	4.87	SA	4.97	SA	4.92	SA
Overall Weighted Mean	4.83	SA	4.81	SA	4.82	SA

[b.] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

Table 6 presents that the teachers (WM = 4.85) and students (WM = 4.71) strongly agreed on the Usefulness of the developed workbook. This workbook serves as a motivation to the learners (WM = 5.00; WM = 5:00); This workbook promotes more independent learning than the conventional one (WM = 4.93; WM = 4.67); This workbook enhances and develops higher order thinking skills among learners (WM = 4.80; WM = 4.77);

Table 6. Perception of teachers and students on the usefulness of the developed workbook

Usefulness[a]	Teachers		Students		Overall	
	WM	DI	WM	DI	WM	DI
The workbook:						
serves as a motivation to the learners.	5.00	SA	5.00	SA	5.00	SA
promotes more independent learning than the conventional one.	4.93	SA	4.67	SA	4.80	SA
enhances and develops higher order thinking skills among learners.	4.80	SA	4.77	SA	4.79	SA
encourages minimal supervision on the part of the research teacher.	4.67	SA	4.33	SA	4.50	SA
provides opportunity to develop discipline and interpersonal relationships among learners.	4.87	SA	4.80	SA	4.84	SA
Overall Weighted Mean	4.85	SA	4.71	SA	4.78	SA

[a.] Legend: 4.51 – 5.00, Strongly Agree (SA); 3.51 – 4.50, Agree (A); 2.51 – 3.50, Fairly Disagree (FD); 1.51 – 2.50, Disagree (D); 1.00 – 1.50, Strongly Disagree (SD)

This workbook encourages minimal supervision on the part of the research teacher (WM = 4.67; WM = 4.33); and this workbook provides opportunity to develop discipline and interpersonal relationship among learners (WM = 4.87; WM = 4.80). It can also be noticed that the overall mean is 4.78. This shows that the teachers and students perceived that the developed workbook is very useful.

Table 7. Difference between the perception of teachers and students on the developed workbook

Areas of Assessment	Respondents	N	Mean	SD	t	df	Sig.	MD
Adequacy	Teachers	15	4.6533	.43731	1.28	43	.208	1.60
	Students	30	4.4933	.37410				
Clarity	Teachers	15	4.7200	.33637	1.26	43	.213	1.33
	Students	30	4.6067	.25452				
Content	Teachers	15	4.7333	.40473	0.64	43	.526	.073
	Students	30	4.6600	.34099				
Objectives	Teachers	15	4.8933	.19809	4.38	43	.000a	.320
	Students	30	4.5733	.24486				
Suitability	Teachers	15	4.8267	.35349	.275	43	.784	.020
	Students	30	4.8067	.13374				
Usefulness	Teachers	15	4.8533	.27740	1.96	43	.055	.14
	Students	30	4.7133	.19429				

[a.] Significant at 1% level

Table 7 shows that the perception of teachers and students towards the objectives of the developed workbook was significantly different at 1% level with F-value of 4.38 and Sig. = .000. Thus, the null

hypothesis is rejected. On the other hand, the perception of the teachers and students towards the adequacy, clarity, content, suitability and usefulness of the developed Competency-Based Research I Workbook was not significantly different at 1% level with the following t-values and Sig, adequacy (t = 1.28, Sig. = 0.208), clarity (t = 1.26, Sig. = 0.213), content (t = 0.64, Sig.= 0.526), suitability (t = 0.275, Sig. = 0.784), and usefulness (t = 1.98, Sig. = 0.055), respectively. Thus, the null hypothesis is accepted.

Table 8 reveals that the level of reliability of the perceptions of teachers and students on the developed Competency-Based Research I Workbook in terms of adequacy of activities (RC = 0.849), clarity (RC = 0.856), content (RC = 0.842), objectives (RC = 0.856), suitability (RC = 0.863), and usefulness (RC = 0.855) were all good.

Table 8. Level of reliability of the perceptions of teachers and dtudents on the developed workbook

Variables	Reliability Coefficient[a]	Level of Reliability
Adequacy	.849	Good
Clarity	.856	Good
Content	.842	Good
Objectives	.856	Good
Suitability	.863	Good
Usefulness	.855	Good

[a] Legend: 0.00-0.50 (Unacceptable); 0.51-0.60 (Poor); 0.61-0.70 (Questionable); 0.71-0.80 (Acceptable); 0.81-0.90 (Good); 0.91 and above (Excellent)

4. Conclusion

In light of the findings of the study, the following conclusions were drawn: (1) The Competency-Based Research I Workbook is adequate, clear, coherent, attainable, suitable and useful for teachers and students as they unlock learnings on research; (2) There is a significant difference on the perceptions of teachers and student on the objectives of the developed Competency-Based Research I Workbook. On the other hand, there is no significant difference in the perceptions of the teachers and students as to the adequacy, clarity, content, suitability, and usefulness. (3) The level of reliability of the perceptions of teachers and students on the developed Competency-Based Research I Workbook in terms of adequacy of activities, clarity, content, objectives, suitability, and usefulness were all good. Considering the above findings and conclusions of the study, the following are a result of this recommendation: (1) The workbook may be supplemental material or an alternative module for instructional purposes. The teachers and learners can use the provided activities for a better understanding of the lessons. (2) Additional activities may provide more avenues for both the teachers and students to learn the lessons on research. (3) A future study may be conducted focusing on the effect of the use of this workbook on the students' academic performance.

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References

[1] J. A. de Villa and F. K. B. Manalo, "Secondary teachers' preparation, challenges, and coping mechanism in the pre-implementation of distance learning in the new normal," *IOER International Multidisciplinary Research Journal*, vol. 2, no. 3, pp. 144–154, 2020. Available at: ssrn.com

[2] B. Magsambol, "Fast facts: DepEd's distance learning," *Pasig, PH: Rappler*, 2020. Available at: rappler.com

[3] N. R. R. Salingay and L. S. Lomibao, "Assess-Practice-Present-Reflect (APPR) Mathematics Module Design: Teachers' Evaluation," *American Journal of Educational Research*, vol. 9, no. 8, pp. 549–554, 2021. Available at: pubs.sciepub.com

[4] T. Guiamalon, "Teachers Issues and Concerns on the Use of Modular Learning Modality," *IJASOS-International E-journal of Advances in Social Sciences*, vol. 7, no. 20, pp. 457–469, 2021. Available at: ijasos.ocerintjournals.org

[5] F. Castroverde and M. Acala, "Modular distance learning modality: Challenges of teachers in teaching amid the Covid-19 pandemic," *International Journal of Research Studies in Education*, vol. 10, no. 8, pp. 7–15, 2021, doi: 10.5861/ijrse.2021.602.

[6] R. Ancheta and H. Ancheta, "The new normal in education: A challenge to the private basic education institutions in the Philippines," *International Journal of Educational Management and Development Studies*, vol. 1, no. 1, 2020. Available at: iiari.org

[7] A. J. S. Talimodao and D. v Madrigal, "Printed Modular Distance Learning in Philippine Public Elementary Schools in Time of COVID-19 Pandemic: Quality, Implementation, and Challenges," *Philippine Social Science Journal*, vol. 4, no. 3, pp. 19–29, 2021, doi: 10.52006/main.v4i3.391.

[8] M. Cahapay, J. Lorania, M. G. Labrador, and N. Bangoc, "Instructional Development for Distance Education amid COVID-19 Crisis in the Philippines: Challenges and Innovations of Kindergarten Teachers," *Asian Journal of Distance Education*, vol. 16, no. 2, 2021. Available at: asianjde.com

[9] G. D. Anzaldo, "Modular Distance Learning in the new normal education amidst Covid-19," *International Journal of Scientific Advances*, vol. 2, no. 3, pp. 233–266, 2021, doi: 10.51542/ijscia.v2i3.6.

[10] A. Abante *et al.*, "A comparative analysis on the challenges of online learning modality and modular learning modality: A basis for training program," *International Journal of Multidisciplinary Research and Analysis*, vol. 4, no. 04, pp. 463–476, 2021, doi: 10.47191/ijmra/v4-i4-17.

[11] A. B. Herrera, M. S. Bersano, and R. G. R. Idul, "Readiness of Students in Flexible Learning Modality: A Convergent Parallel Mixed-Methods Study," *International Journal of Asian Education*, vol. 2, no. 4, pp. 514–530, 2021, doi: 10.46966/ijae.v2i4.118.

[12] M. A. L. Agarin, "The Challenges and Status of Modular Learning: Its Effect to Students' Academic Behavior and Performance," *EPRA International Journal of Multidisciplinary Research*, 2021. Available at: eprajournals.com

[13] E. S. Trovela, "Perceptions of Parents and Learners to Modular Distance Learning as Contemporary Teaching Strategy," *EPRA International Journal of Research and Development*. doi: 10.36713/epra7330.

[14] R. Rufii, "Developing module on constructivist learning strategies to promote students' independence and performance," *International Journal of Education*, vol. 7, no. 1, p. 18, 2015, doi: 10.5296/ije.v7i1.6675.

[15] A. L. Madrazo and R. V. Dio, "Contextualized Learning Modules in Bridging Students' Learning Gaps in Calculus with Analytic Geometry through Independent Learning.," *Journal on Mathematics Education*, vol. 11, no. 3, pp. 457–476, 2020, doi: 10.22342/jme.11.3.12456.457-476.

[16] K. Livingston, "Independent learning," *Encyclopedia of the Sciences of Learning. Boston: Springer*. doi: 10.1007/978-1-4419-1428-6_895.

[17] M. B. Bibon, "The Use of Culture-Based Module Integrating Folk Hunting Practices in Cagraray Island, Philippines for Teaching Biodiversity," *International Journal of Formal Sciences: Current and Future Research Trends*, vol. 8, no. 01, pp. 13–26, 2020. Available at: ijfscfrtjournal.isrra.org

[18] S. and C. O. (UNESCO) United Nations Educational, *Education for all global monitoring report 2010: Reaching the marginalized*. Unesco Paris, 2010. Available at: hdl.voced.edu.au

[19] E. J. d Ramirez and W. I. Formalejo, "Research instruction among secondary schools implementing Science, Technology and Engineering (STE) Program in MIMAROPA Region," *The Palawan Scientist*, vol. 9, no. 1, p. 1, 2017. Available at: www.palawanscientist.org

[20] M. B. Barquilla and M. T. Cabili, "Forging 21st century skills development through enhancement of K to 12 gas laws module: a step towards STEM Education," in *Journal of Physics: Conference Series*, 2021, vol. 1835, no. 1, p. 012003. doi: 10.1088/1742-6596/1835/1/012003.

[21] K. Sejpal, "Modular method of teaching," *International Journal for Research in Education*, vol. 2, no. 2, 2013. Available at: www.raijmr.com

[22] E. E. Gonzales, "A Modular Approach Utilizing Decision Tree in Teaching Integration Techniques in Calculus," *Department of Arts, Sciences and Teacher Education, City College of Calamba, Calamba City, Laguna, Philippines*, 2015. Available at: www.apjmr.com

[23] E.-E. Ambayon and C. Millenes, "Modular-based approach and students' achievement in literature," *Available at SSRN 3723644*, 2020, doi: 10.7575/aiac.ijels.v.8n.3p.32.

[24] C. M. Cheng and M. B. A. Bakar, "The impact of using modules in the teaching and learning of english in malaysian polytechnics: an analysis of the views and perceptions of english language lecturers," *Jabatan Pengajian Am, Politeknik Melaka, Jebatan Politeknik, Kementerian, Pendidikan Malaysia*, 2017. Available at: www.coursehero.com

[25] M. Abisado, M. G. Unico, D. G. Umoso, F. E. Manuel, and S. S. Barroso, "A flexible learning framework implementing asynchronous course delivery for Philippine local colleges and universities," *International Journal of Advanced Science and Engineering*, vol. 9, no. 1.3, 2020, doi: 10.30534/ijatcse/2020/6591.32020.