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An Evaluation of the Proposed Grade 12 General Chemistry Learning Modules

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ABSTRACT: This research endeavored to assess developed and validated a proposed learning module in General Chemistry during the Second Semester, Academic Year 2021-2022 in public secondary schools in Bulacan, Philippines. Teachers play an essential role in validating and evaluation of instructional materials. As facilitators of learning, they must ensure that instructional materials serve their purpose of upholding an effective teaching and learning process. The study aimed to evaluate the proposed Grade 12 General Chemistry learning modules as perceived by Chemistry Experts and Science Teachers in the 12 public secondary schools offering STEM strand in the Division of Bulacan, Philippines. The modules are evaluated based on :(1) content, (2) format, (3) presentation and organization, (4) learning activities, (5) evaluation activities and (6) accuracy and up-to-datedness of information. The demographic profile of 11 Chemistry experts showed that the majority are female, BSED graduates in Physical Science with a doctoral degree in Development Education and 1-12 years teaching General Chemistry subject. Grade 12 Chemistry teachers are mostly females who have bachelor's degree in Physical Sciences, with master's units and 1-5 years of teaching Grade 12 General Chemistry in the K to 12 Curriculum. Chemistry experts and science teachers assessed the five modules using descriptive survey method employing quantitative analysis. They both evaluated the proposed learning modules satisfactory in the six dimensions. They did, however, make several suggestions for improving the proposed learning module.

Keywords*:* general chemistry; instructional materials; learning module; validation; evaluation

INTRODUCTION

In teaching science, the ultimate goal is to promote scientific and technological awareness among students. This goal can only be achieved if science teachers are effective enough in the delivery of science instruction. According to recent studies, effective teaching raises student achievement and closes achievement gaps for all children [1]. As a result, good instruction each year could eventually close science achievement discrepancies.

Furthermore, the goals of science instruction necessitate extensive teacher preparation and substantial specialization in the sciences. This is in addition to the pupils' natural talents and abilities. Developing a critical and inquisitive mind ensures a constant search for fresh information and systematic ways to issue solutions [2]. To achieve these goals, all possible solutions must be exhausted to improve science education our country.

Over the last century, science education has become increasingly important. However, one of today's challenges in science education are found in science instruction. A teacher who has acquired teaching abilities must learn to use a range of teaching tactics to be effective in the classroom. This means that a teacher's ability to maximize various teaching styles can considerably improve a teacher's efficacy in accomplishing instructional objectives. Science teachers must have in-depth knowledge of the subject they are teaching, the nature and techniques of science, and its impact on students' daily lives, to be effective.

Chemistry is a branch of science that students and teachers usually find a complex subject to understand. In fact, there had been various studies conducted to investigate such a trend.

The Programme for International Student Assessment (PISA) 2018 and National Achievement Test are test in which students consistently score poorly in Science. PISA is a student assessment of 15-year-old learners across 79 countries done by the Organization for Economic Co-operation and Development (OECD). In the 2018 PISA, the Philippines ranked 70th in reading, with an average of 340 against the OECD average of 487. With 353 points and 357 points for both math and science, Filipino students also ranked low against the 489 OECD average for both categories.

With the aforementioned issue, the teacher cannot anticipate much in terms of idea mastery and application from the students. Evidently, the students are underperforming in science. Some educators contend that teachers should develop the students' metacognition to enable them to understand the content and monitor their learning. The contention is that if students are trained to use comprehensive strategies and monitor their application, the practice will lead to more effective learning and, in turn, facilitate the acquisition of knowledge.

Every student learning Chemistry should have a firm grasp of reduction and oxidation reactions fundamentals. Students' diverse opinions are frequently caused by prior knowledge, cultural orientation, ecological background, motivation, and instructor input. If this is the case, teachers must assist pupils in overcoming their misunderstandings.

Numerous studies and innovations are going on at the core of science education. Researches on teaching have shown that effective instruction is facilitated by the appropriate content and the selection and utilization of strategies, procedures, and materials within the context and objectives of teaching. Furthermore, traditional approaches are becoming obsolete; thus, more interactive approaches are deemed suitable. Studies demonstrate that when students are actively engaged in studying, they learn more effectively.

One cannot eradicate the conventional way of teaching, but it can be modified if the teacher adds and implement student-centered teaching strategies [3]. Teaching strategies and instructional materials, like modules, must incorporate a more active and student-centered approach. Suiting modules to the students' learning needs and abilities will teach them to be independent learners and responsible for their learning. Students will learn best if given adequate time and study at their capacity and pace.

A thorough examination of psychological theories of learning, such as Burger's (1986) Theory of Concept Formation and Skinner's (1968) Theory of Reinforcement, led to the concept of module development, which follows the same framework as programmed learning. If the learner is provided feedback on his performance and can read the material again for a better understanding of the idea under consideration, he will be more motivated to continue his studies with programmed learning [3].

A module is a free-standing unit of learning that may be linked to other modules to form a coherent learning program. The title, goals and objectives, knowledge, ideas, skills and attitudes, teaching and learning styles, and evaluation methods are all included in a module. If the modules only use lecture-style teaching, students may not be actively engaged in learning [4]. As a result, when creating modules, one must think about the methods that will actively engage students in learning.

The researcher's strong belief in the promise of modules as effective non-traditional learning materials prompted him to venture into the development of modules to enhance the learning of the Senior High School student in Chemistry.

Statement of the Problem

The study aimed to assess the proposed learning modules on General Chemistry. Specifically, it aimed to succeeding the following problems:

1. What were the readability and comprehension levels of the proposed learning module?
2. How do the experts' and teachers' assess the proposed learning module based on the six dimensions?
3. What are the implications of the findings of the study to General Chemistry teaching?

Theoretical Framework

Constructivism served as the foundation for this research. Under constructivism, students get a better understanding and knowledge of the world by doing things and reflecting on them. When students learn

anything new, they must integrate it with their prior knowledge and experiences, which may cause them to reconsider their positions or discard the new material as irrelevant [5]. They become active creators of their knowledge in these situations. To do this, students must ask questions, explore and assess what they know.

The constructivist view of learning encourages students to use active techniques, for instance, experiments and real-world problem solving, to create more knowledge. Then, students can reflect and discuss what they are doing and how their understanding is changing.

The guiding principles of constructivism include (1) posing problems of emerging relevance to students; (2) structurally organized learning around key concepts; (3) seeking and valuing students' points of view; (4) adapting curriculum to students' suppositions; and (5) in the context of teaching, assessing student learning [6].

According to Bruner's theoretical framework, learning is a process in which students gain new ideas or concepts based on their existing or previous knowledge. The learner uses a cognitive framework to select and change information, build hypotheses, and make judgments. Cognitive structure gives experiences meaning and organization, which allows the individual to "move beyond the information provided" [7].

Bruner continues, "A theory of instruction should address four major aspects: (1) predisposition to learning, (2) ways to structure a body of knowledge in such a way that it can be easily grasped by the learner, (3) the most effective sequences for presenting material, and (4) the nature and pacing of rewards and punishments." Good knowledge structuring approaches should result in information being simplified, new propositions being generated, and more information being manipulated. He points out four basic concerns in any learning situation: (1) understanding, (2) readiness, (3) independence, and (4) motivation. This study is guided by the third basic concern – to develop independence among learners. He stated that it is essential to develop a student to become an independent learner and be a self-sufficient person in problem-solving who can correct his errors by himself alone.

The sensory stimulation idea, on the other hand, proposed that learning be accomplished by a broader diversity of colors and volume labels, statements, visually presented data, and the utilization of a variety of media and methodologies. The more senses that are involved in the learning process, the better. The key to directing and guiding learning is to understand the learners' needs, interests, and attitudes. It is widely acknowledged that the best learning takes place when the greatest number of senses are stimulated. According to Laird, researchers discovered that 75 percent of the great majority of adult learners learn through looking. Hearing (13%) and touch and smell accounted for what is known. The more the material in multi-sense stimulated, the greater learning there is. The visual nature of the stimulation stimulates the students' senses, which leads to a liking to engage in the activity, which results in greater retention [8].

Figure 1. illustrates the theoretical paradigm of the study. Through the modules, students with prior knowledge will integrate new experiences and interpretations to construct their meaning with this previous knowledge; thus, learning is constructed. The modules will guide knowledge and allow students to actively participate in discovering concepts by allowing them to experiment, manipulate objects, ask questions, and try things that do not work. The nature of the modules will pique students' interest through sensory stimulation. All of these factors will contribute to successful and meaningful learning.

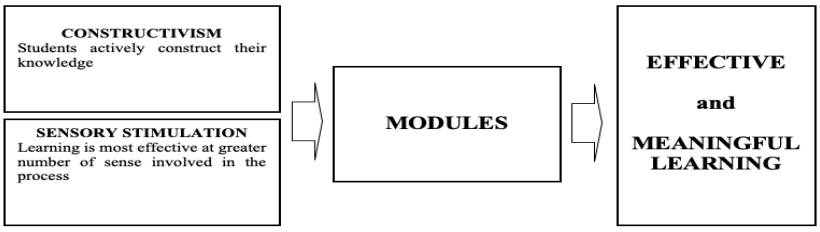

FIGURE 1. Theoretical Framework

METHOD

Research Design

The study utilized a descriptive survey method using questionnaire to collect quantitative and qualitative data.

The Respondents

The 11 Chemistry experts and 33 Grade 12 General Chemistry teachers of 12 public secondary schools offering Science, Technology, Engineering and Mathematics strand comprising the Division of Bulacan were requested to serve as respondents.

Sampling

In choosing the respondents, no sampling was done since all the teachers teaching Grade 12 General Chemistry were respondents of the study. The teacher respondents were public secondary school teachers of the Division of Bulacan, Philippines. Both Chemistry experts and Grade 12 General Chemistry teachers were identified regarding their demographic profile characterized by sex and age, educational qualification, and length of service in teaching Grade 12 General Chemistry in the K to 12 Curriculum. However, Chemistry experts were chosen based on their length of service in teaching General Chemistry.

Materials

1. Grade 12 General Chemistry 2 Proposed Modules

These refers to the developed learning modules to be used in teaching Grade 12 General Chemistry. The Department of Education provided curriculum content standards reflected in the Curriculum Guide of the Grade 12 General Chemistry.

2. Assessment of Grade 12 General Chemistry Modules

The ADDIE Model (Analyze, Design, Develop, Implement, and Evaluate) by Watson, Murin, Vashaw, Gemin, and Rapp in Tampa in 2013 was the basis in the primary procedure of the study [9]. The analysis phase involves the gathering of information about the modules based on the (5) dimensions from Grade 12 General Chemistry teachers who assessed the proposed learning modules. The design included areas to be evaluated, as well as the instrument and procedure to gather the data. Development of this study made use of the perceptions and suggestions of Chemistry experts and teacher-respondents in enhancing the Grade 12 General Chemistry proposed learning modules. Implementation reflected the incorporation of Chemistry experts' and teachers' feedback to improve the proposed modules.

Instrument and Instrumentation

The research instrument, which is the researcher-made questionnaire consists of two parts:

Part 1 – Expert and Teacher Respondent Profile. This refers to the background information of Chemistry experts and Grade 12 General Chemistry 2 teachers regarding sex and age, educational qualification, and length of service in teaching Grade 12 General Chemistry 2 in the k to 12 Curriculum.

Part 2 – "Experts' and Teachers' Perception of Proposed Learning Module Questionnaire" was used for data collection. It dealt with determining the Chemistry experts' and teachers' perceptions of the Grade 12 General Chemistry proposed learning modules. The instrument was first validated by the researchers by presenting it to three different scholars.

The five significant topics evaluated in this part of the questionnaire are as follows:

(1) Module 1 – Electronic Structure and Periodicity
(2) Module 2 – Chemical Bonding
(3) Module 3 – Intermolecular Forces and Liquids and Solids
(4) Module 4 – Physical Properties of Solutions
(5) Module 5 – Thermochemistry

The said instrument was validated by 11 Chemistry expert's and was pilot tested to 15 Grade 12 General Chemistry teachers who were not respondents of the study. They were teachers who taught Grade 12 General Chemistry before, but not at present. In determining the reliability of the survey questionnaire for experts and teachers, the researcher made use of Cronbach Alpha Reliability Coefficient as the statistical tool. From the results, it can be surmised that there were very high results in all of the areas considered for assessment. The overall result of 0.96 was interpreted as Very High Reliability. This

means that the instrument has achieved consistency of responses from the respondents across all conditions given for each category of assessment, and such as, its reliability is established.

Table 1. Cronbach Alpha Reliability Coefficient of the Experts and Teacher' Survey Questionnaire

Dimensions	Reliability	Description
Content	0.97	VH
Format	0.96	VH
Presentation and Organization	0.97	VH
Learning Activities	0.94	H
Evaluation Activities	0.97	VH
Accuracy and Up-to-datedness of Information	0.96	VH
Overall	0.96	VH

Legend:

0.95 – 0.99	Very High Reliability (VH);
0.90 – 0.94	High Reliability (H);
0.80 – 0.89	Fairly High Reliability (FH)
0.70 – 0.79	Rather Low Reliability (RL)
Below 0.70	Low Reliability (L)

The assessment on the proposed Grade 12 General Chemistry modules as perceived by Chemistry experts and teacher-respondents manifested their ratings of each statement using a scale of the checklist that has a corresponding descriptive rating, specifically very satisfactory (VS), satisfactory (S), poor (P), and not satisfactory (NS), for the purpose of analyzing and interpreting the data.

Below are the four-point scale used to interpret the responses for each item:

1.00 – 1.49	Not Satisfactory
1.50 – 2.49	Poor
2.50 – 3.49	Satisfactory
3.50 – 4.00	Very Satisfactory

Frequency counts were used to analyze the demographic profile of the Chemistry experts and Grade 12 General Chemistry teacher-respondents. The options that obtained the highest frequency were treated as the dominant characteristics of the respondents. Results of the interpretation served as the derived profile of the Chemistry experts and Grade 12 General Chemistry teachers. The weighted mean was employed in determining the quality of proposed Grade 12 General Chemistry modules as perceived by General Chemistry teachers and Chemistry experts in the six dimensions of evaluating the instructional material. Weighted mean per dimension was computed by adding the total rating and divide it to the total number of teacher respondents. Ratings were tabulated and interpreted through the use of computer assisted statistical tool. Specifically, the weighted mean for each dimension with corresponding qualitative description and the overall mean were used in determining the results of the evaluation of modules.

RESULT AND DISCUSSION

Result of Qualitative Analysis

Majority of the experts are female, they were master's degree holders in Chemistry (7, 64%), with doctoral units in Science Education (3, 27%), or with doctoral degrees in Chemistry (1, 9%). Age is cluster between 31-40 years old (7, 64%), 51-75 years old (1, 9%), 41-50 years old (2, 18%), and 23-30 years old (1, 9%). Most of them or 8, 73% have taught for 1-15 years; 1, 9% , 16-25 years; 1, 9%, 26-35 years and 1, 9% , 36-45 years respectively.

The Grade 12 General Chemistry teachers in Division of Bulacan were dominated by females (26, 79%) and with a smaller number of males (7, 21%). The age of the teacher's cluster between 23-40 years old (25, 76%) followed by age range 41-45 (7, 21%), and last 51-60 (1, 3%). Regarding educational attainment, the majority of the teacher respondents' have completed the undergraduate course BSED (29, 88%), and the other have non-education degrees (4, 12%). The BSED graduates are Physical Science majors (21, 64%), General Science (5, 15%), Natural Science (2, 6%) and Chemistry (1, 3%). Non-education graduates are those who graduates in other fields such as BS Engineering (3) and BS

Pharmacy (1). Out of the four non-education respondents, three have 18 education units and 1 Teacher Certificate Program graduates. Out of 33 teacher respondents, 23 or 70 % have a lower educational qualification (BSED/ BS with education units); with master's units (9, 27 %); and with master's degree (1, 3%). In terms of years in teaching Grade 12 General Chemistry under the K to 12 Curriculum, majority of the teachers, 13, 39% have taught for only one year; 10 or 30% have taught for two years; 5 or 15% for three years; 2 or 6% for four years; and 3 or 9% for five years, while most experts 5 or 45% have taught General Chemistry for 15 years.

1.Chemistry expert's quantitative evaluation

The proposed Grade 12 General Chemistry modules got satisfactory quality in all the six dimensions for Chemistry experts with an overall weighted mean of 3.52. Evaluation was based on the six aspects of evaluating instructional materials according to the major area of concern that needs utmost attention and action: (1) presentation and organization, (2) format, (3) content, (4) learning activities, (5) evaluation activities, and (6) accuracy and up-to-datedness of information.

2. Grade 12 General Chemistry teachers' quantitative evaluation

The Grade 12 General Chemistry teachers also evaluated the module satisfactory in all six dimensions. However, they differ in the major area of concern as follows: (1) content, (2) presentation and organization, (3) learning activities, (4) evaluation activities, (5) format, and (6) accuracy and up-to-datedness of information.

3. Consolidated description of Chemistry experts' and Grade 12 General Chemistry teachers' quantitative evaluation

3.1 Content: Certain conditions in these aspects were not fully met like the provision of sufficient discussion of concepts and glossary of terms.

3.2 Presentation and organization: The sequence of topics in the curriculum guide is consistent with the series of issues in the learner's material and teacher's guide. Ali pointed out that the stated objectives of the modules should lead to instructional quality [10].

3.3 Learning activities: The teacher respondents stated that the learning modules presents more activities than discussion. Readily available General Chemistry modules lack the integrated science process skills which allow students to learn what it means to do science by applying experimental skills, solving problems, and developing critical thinking skills. Macarandang explained that enrichment activities enhance student's learning of the concepts [11].

3.4 Evaluation of activities: Students can answer the pretest and the assessment of the lesson with which they can ensure that teachers are evaluating the actual learning of the students.

3.5 Accuracy and up-to-datedness of information: Chemistry experts and teacher respondents were very satisfied with this criterion.

3.6 Format: Regarding format, the clarity, illustrations, pictures, and appropriateness of colors still needs enhancement. As explained by Olurinola, colors have a positive effect on the attention-retention rate of students inside the classroom [12].

Table 2. Summary Evaluation of Proposed Grade 12 General Chemistry Modules based on the Chemistry Experts' and Teacher-Respondents' Perception

INDICATORS	Teachers' Perception		Chemistry Experts' Perception		Combined Perception	
	Mean	Desc	Mean	Desc	Mean	Desc
1. Content	3.31	S	3.63	VS	3.47	S
2. Presentation and Organization	2.98	S	3.18	S	3.08	S
3. Learning Activities	3.06	S	3.27	S	3.17	S
4. Evaluation Activities	3.09	S	3.36	S	3.23	S
5. Format	3.01	S	3.54	VS	3.28	S
6. Accuracy and Up-to-datedness of Information	4.00	VS	4.00	VS	4.00	VS
Overall weighted mean	**3.24**	**S**	**3.50**	**VS**	**3.38**	**S**

Legend: *1.00 - 1.49 Not Satisfactory (NS), 1.50 - 2.49 Poor (P), 2.50 - 3.49 Satisfactory (S), 3.50 - 4.00 Very Satisfactory (VS)*

Four Chemistry Experts' and Grade 12 General Chemistry Teachers' Consolidated Qualitative Suggestion on the Enhancement of the Proposed Modules.

Regarding content, the respondents suggested that there should be a comprehensive discussion before and after each module, with glossary of terms, and summary. In the area of presentation and organization, the topics were consistent in the curriculum guide, with teacher's guide and with the learner's material. Furthermore, regarding learning activities, students will be exposed to science inquiry activities with more emphasis on the acquisition of integrated science process skills for them to develop critical thinking skills and become independent learners. In the area of evaluation activities, there is a variation of pre- and post-assessment items in each module. Regarding format, picture, illustrations, and diagram must be clear and colored as to avoid misconception on the part of the learners.

Discussions

The findings of this study indicated that the strengths, weaknesses, gaps and limitations, as well as the worth and merit of the proposed learning modules which served as bases in the advancement of initiatives and improvements. Rossi, Lipsey and Freeman emphasized that evaluation is a systematic determination of a subject's merit, worth and significance using criteria towards an attempt to analyze what is ideal against what is really happening in the teaching and learning process [13]. Clark explained that evaluation of learning materials like formative evaluation does not only help improve the learning materials but also forms the basis on which proper learning intervention can be given in order to help the learners mastery of the desired skills and knowledge [14].

In the profile of Grade 12 General Chemistry teachers, results were shown in terms of sex and age, educational qualification and length of service in teaching General Chemistry of K to 12 Curriculum. The data indicate that there exists a slow upgrading of educational attainment among teachers. This has implication on teacher's competence in evaluating the proposed learning modules. As implied that in evaluating materials for instruction, competence is one of the essential guiding principles for quality evaluators. However, in terms of educational qualification of Chemistry experts, majority are BSED graduate major in Physical Sciences. Most of them have master's degrees or Doctoral degree in Education which indicates their competence in evaluating Chemistry content of the modules.

Moreover, in terms of length of service in teaching Grade 12 General Chemistry of the K to 12 Curriculum, among 33 teacher respondents, majority have taught General Chemistry since the start of the K to 12 Curriculum for at least a one year but had no chance to refine their teaching of the Grade 12 General Chemistry – Thermochemistry Modules in the succeeding years. Problems arise when teachers cannot use the learning material appropriately since they lack mastery of the subject matter. These finding could give insights to school heads in terms of loading of the subjects to teachers.

Level of Perception and suggestions of Teachers

The teachers' overall perceptions of the Grade 12 General Chemistry 2 modules, came up with an overall rating of "Satisfactory". Satisfactory means errors are present but were very minor and must be fixed. According to Oakes and Saunders, "…instructional materials are the primary tools the teachers use to organize their lesson and make content knowledge and skills available to students". Therefore, efficient learning materials promotes effective teaching and learning process. While it is true that competence of teachers may reinforce learning, still it cannot be denied that poor quality of learning materials still greatly affects the teaching and learning process [15].

The results of this study reveal that the proposed modules are generally viewed by the respondents as acceptable in terms of objectives, giving the students a good understanding of the chemical concepts and suitability of content to the year level of students. But it must be noted that the entire conditions set for content was only rated as satisfactory by the teacher respondents and it is low in terms of its adequacy in the presentation and discussion of the content. The related studies of Mercado and Garcia revealed that when objectives in the proposed module are made clear, specified with time allotment, it possesses a favorable degree of instructional quality [16, 17]. The results also confirmed the statement of Ali that clearly stated objectives have an integral role in the instructional quality of the module [10]. Moreover, the module needs to motivate and stimulate students' interest to study Chemistry. This finding is similar to the conclusion of Jamwal that motivation plays an important role on learning content using modules [18].

Furthermore, in the assessment of the proposed learning modules in terms of presentation and organization wherein ratings were all satisfactory, implies that the material still need improvement and enhancement most particularly in terms of students' level of understanding of the new vocabulary words. Salandanan stated that modules should be written in clear and correct language suitable to the level of the target learners so as to achieve efficient communication between the learner and the module [19].

In the learning activity aspect of the proposed learning modules, one significant factor that may have contributed to the satisfactory rating was the claim by both Chemistry experts and teacher-respondents that ninety percent (90%) of the learning module are all activities for developing critical thinking skills and developing curiosity through experiments. Such finding supports the lowest the lowest weighted mean which for the criterion, "the number of activities in the module is just enough for the allotted time". Although not the main concern, this gives insight on one of the domains of the Science Curriculum which is the acquisition of integrated science process skills through laboratory activities in the module. While in terms of evaluation activities, the proposed learning modules were rated satisfactory in all conditions, which signifies the usability of the items in the evaluation exercises as assessment of the content learned and objectives. The pretest and posttest part of the modules were really aimed to utilized by the teachers as their reference for formative and summative assessment. As explained by Reardon, Scott and Verre, results of evaluation of learning materials play a pivotal role in deciding what the students learned, what instructors teach in schools, and what teachers do as facilitators of learning [20].

Results showed in the format are that quality of the said materials was observed to have not met the standards in terms of clarity of illustration, attractiveness, and appropriateness of colors. In a related study by Olurinola, colors have positive effect on the attention-retention rate of students inside the classroom. He also added that students exposed to congruent colors have better performance than those who are not exposed to colored instructional materials [12].

The last are of concern is the accuracy and up-to-datedness of information. It got the perfect weighted mean among all the six dimensions in the evaluation of the proposed learning modules, which indicates it as the strongest among the identified dimensions. Chinwendu has stated lexicosyntactic errors contained in the instructional materials if not corrected will make students the conveyor belt of the errors contained on the material [21]. This means that there is no room for error and if there are errors in the instructional materials they should be corrected so as not to multiply the commission of mistakes since most teachers and students are dependent on these materials for teaching and learning.

With this in mind, majority of the respondents were very optimistic and enthusiastic in their desire for the improvement of the proposed learning modules, which can be a main tool for instruction. What makes this study distinct from previous researches is the fact that the improvement and enhancement of the proposed learning material is based on the evaluations and suggestions of both Chemistry experts and teacher-respondents who were the target implementer of the material and has direct interaction with students. Without sufficient and quality learning materials, there is always the danger that learners do not acquire the necessary knowledge, skills, and attitude appropriate for them to be ready and confident in all the rudiments of learning and are equally competitive with learners in a global scale.

CONCLUSION

Chemistry experts' and Grade 12 General Chemistry teachers rated the five proposed Grade 12 General Chemistry modules as satisfactory along with six dimensions which signified the need for enhancement. The majority teacher respondents have low levels of education, mostly, bachelor's degree. A poor academic qualification may affect the competence and skills for teaching Chemistry in the K to 12 Curriculum. Teacher-respondents have limited number of years teaching General Chemistry in the K to 12 Curriculum, which mean they have less mastery of the content and skills, which could affect the quality of learning of the students. Based on the findings and conclusions derived from the study, there is a need to encourage more senior high school graduates to take education courses major in Chemistry or aligned course specializing in Chemistry. Retooling and training of teachers on the appropriate use and implementation of the modules. There is also a need to encourage teachers to pursue higher learning in order to upgrade their educational qualifications improving their competence and skills to teach Chemistry in the K to 12 Curriculum.

A similar study may be undertaken to other disciplines under the K to 12 Curriculum most specially science subjects using the research-made questionnaire so as to produce modules that will complete the enhancement of Grade 12 modules and will make it comprehensive. Another undertaking may be

conducted using the students as respondent of the research to have triangulation of data. This evaluation study and its survey tool hopes to contribute data and information significant for the enhancement of the instructional materials. Developed and enhanced Grade 12 General Chemistry modules and their use would redound to better and improved performance of Grade 12 students in Science, specifically in Chemistry.

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