KNOWLEDGE-BASED ACTIVITIES IN CHEMISTRY FOR SCIENTIFICALLY CHALLENGED LEARNERS OF GRADE 7

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Abstract*:* This study dealt with the development and validation of Knowledge-Based Activities in Chemistry for Scientifically Challenged Learners of Grade 7 in Lagundi-CCL National High School during the school year 2017-2018.

The developed knowledge-based activities in Chemistry consist of four (4) motivational activities such as priming and games, four (4) group task activities and fourteen (14) individualized task activities such as puzzles, picture interpretation, activity sheets and pocket-based activity sheets excluding applications that covers the lessons regarding solutions, substances and mixtures, periodic table, elements and compounds, acids and bases and properties of metals and non-metals.

The participants of the study were the identified twenty-one (21) scientifically challenged learners of Grade 7. They were given the validated test before and after exposure to the developed knowledge-based activities in Chemistry. Likewise, for the acceptability of the developed knowledge-based activities in Chemistry, ten (10) Chemistry teachers evaluated the material utilizing the adapted-questionnaire checklist.

Descriptive, developmental and experimental methods of research were used in the study. In order to determine the level of performance of the participants mean and standard deviation were used. Moreover, dependent t-test was used to determine the significant difference on the level of performance of the participants. Lastly, weighted mean was used to determine the level of acceptability of the developed knowledge-based activities as evaluated by the teacher-respondents.

On the level of performance of the participants in different lessons in Chemistry before and after exposure to the developed knowledge-based activities: they performed Fairly Satisfactory in the lessons, solutions, substances and mixtures, elements and compounds and acids and bases before exposure to the knowledge-based activities. However, after exposure to the material they performed Very Satisfactory. While on the lessons, properties of metals and non-metals, before exposure to the material they performed Fairly Satisfactory and after exposure, the participants' performance was Outstanding.

On the significant difference on the level of performance in Chemistry before and after exposure to the material with respect to the different lessons or topics, there was a significant difference on the level of performance of the learners.

On the level of acceptability of the developed knowledge-based activities in Chemistry with respect to the different criteria, the expert-respondents agreed that the material was Very Highly Acceptable.

The study concluded that the level of performance of the participants improved and increased after their exposure to the developed knowledge-based activities in Chemistry, level of performance of the participants significantly differed after exposure to the material and with the evaluation made by the experts, it was concluded that the material possessed the characteristics of a good instructional device.

Keywords: *knowledge-based activities, scientifically challenged learners, level of performance, level of acceptability.*

Introduction

Learning concepts in science subject requires effort through scientific, problem solving and investigative skills to unlock difficulties in learning scientific concepts and ideas. In simple word, it is a hands-on, minds-on method. Meaning, it is very important to show the interconnectedness of the lessons to their everyday concerns and most especially to their daily lives.

Nowadays, many of the learners' perspective regarding Science subject is negative because the learners find the subject to be complicated and difficult one. Maybe one of the reasons is the inclusion of different complex, scientific, technical and mathematical terms as the learners browse in the learning module released and issued by the Department of Education.

Once the learners find the topic hard to understand, it is noticeable to them that the topic is uninteresting based on their actions inside the classroom. The result is, the learners are preferably doing their own business instead of listening to their teachers during discussion. This is commonly experienced by the teachers because aside from being professionals, teachers can also be psychologists. This might contribute to the low performance of learners in different types of examinations and to the entire performance of the school.

In the test result revealed such as quizzes and quarterly examination, most of the learners obtained low scores because of lack, limited and insufficient activities found in the module.

In the National Achievement Test conducted annually, Lagundi-CCL National High School for the three consecutive school years of 2012-2013, 2013-2014 and 2014-2015, Science subject got the mean percentage of 33.01, 32.76 and 32.46 respectively. The results show that there is a decrease or low percentage of scores on the performance of school in the National Standardized Test.

With this scenario, low scores obtained by the learners during the examinations would be one of the factors affecting the percentage in the National Achievement Test since all the coverage lessons during high school study may be included in the standardized test as measure of performance and it is really important also for them to learn first the basic concepts in Science.

In the survey of Third International Mathematics and Science Studies (2011) the Philippines ranked 41st in Science among 45 countries around the world and this is a sad fact for occupying the lower level in the world education this is a reality with which teachers have to reflect and think.

These significantly suggest that even the test results of small educational institution may affect the holistic performance of the country when it comes to educational system.

In connection to that problems/gaps, learners obtained or got a failing grades such as 74-below equivalent to the descriptive rating of did not meet expectations really affects not only their performance but also the holistic performance of the entire class that also contributes to the promotion rate of the school. The reason that the learners got the failing grades may be due to poor habits and lacking interests, or the learners really have difficulties in understanding the concept as observed by the teachers.

DepEd Order No. 8 s. 2015 or the Policy Guidelines on Classroom Assessment on the K to 12 Basic Education Program stated that:

> "A learner who receives a grade below 75 in any subject in a quarter must be given intervention through remediation and extra lessons from the teachers of that subject".

It is good to have a learning module but it does not mean that the teachers and learners will be of dependent on that certain module. Sometimes, learning module is not enough to learn the concept. There are learning module containing limited activities connected to the certain subject matter that leads the learners to the misconceptions due to lack of worksheets and activities.

This gives the researcher a hint to conduct the study by making and developing knowledge-based activities that will somehow help the learners to learn and better understand the concepts behind the particular topics to be discussed then suddenly apply such in their everyday lives.

The aforementioned problems/gaps are the reasons why the study is conducted because of the common problems encountered and evaluated by the teachers. As teacher of Science subject, the researcher came up to the idea of conducting a study regarding the remediation of scientifically challenged learners through developing knowledge-based activities that will help the struggling learners in learning Chemistry. The content followed the prescribed curriculum for Grade 7 learners in Chemistry subject.

This study was conducted with the aim of developing and validating Knowledge-Based Activities in Chemistry for Scientifically Challenged Learners of Grade 7. The developed knowledge-based activities focused only on the concepts and principles on the topics in Chemistry without performing any experiments. In addition, the study is based from the curriculum prescribed under the K-12 Curriculum Guide in Science for Grade 7 Learners.

Specifically, this study was conducted to determine: 1. the level of performance in Chemistry of Scientifically Challenged Grade 7 learners before and after exposure to the developed knowledge-based activities with respect to the different topics; 2. the significant difference on the level of performance in Chemistry of the Scientifically Challenged Grade 7 learners before and after exposure to the developed knowledge-based activities in Chemistry; and 3. the level of acceptability of the developed knowledge-based Activities in Chemistry with respect to objective, content and organization/presentation.

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This was conducted at Lagundi-CCL National High School in the Division of Rizal, Department of Education during the school year 2017-2018. The participants of the study were the identified twenty-one (21) scientifically challenged learners through total enumeration from four sections of Grade 7 who are grouped heterogeneously.

The participants were identified based on their grades/ratings in Chemistry which fall under 74-below equivalent to descriptive rating of "did not meet expectations" in K-12 way of giving grades during first grading period. At first, they were given a set of pretest and after exposure to the developed knowledge-based activities, posttest was given to determine the level of increase in their performance.

The topics are solutions, substances and mixtures, periodic table, elements and compounds, acids and bases and properties of metals and non-metals with focused learning competencies. The first learning competency on the topic solutions, substances and mixtures, is to distinguish mixture from substances based on a set of properties. The second learning competency on the topic elements and compounds, is to recognize that substances are classified into elements and compounds. The third learning competency on the topic acids and bases, is to recognize and investigate the properties of acidic and basic mixtures. The fourth learning competency on the topic properties of metals and non-metals, is to describe some properties of metals and non-metals such as luster, malleability, ductility and conductivity. Each learning competency is composing of 15 items.

Experimental method was utilized to determine the level of performance of the participants before and after the exposure to the developed knowledge-based activities on different topics in Chemistry 7 as revealed in the pretest and posttest results.

Meanwhile, descriptive and developmental method are applied to determine the acceptability and validity of the developed knowledge-based activities using the adapted questionnaire-checklist.

The ten (10) experts who are Science teachers of Lagundi-CCL National High School and Morong National High School served as respondents who validated to test the acceptability of the developed knowledge-based activities in terms of objective, content, organization and presentation.

The following variables drawn out from the reading and researches were discussed further and conceptually defined for better understanding of the study.

Knowledge-Based Activities

One of the simple activities to implement in engaging learners to learn on their own is through knowledge-based activities focusing on the completion of particular task as a measure of success. Knowledge-based activities can be defined as set of learning activities and materials that will engage the learners to better understand the concepts.

According to Luistro, DepEd Secretary (DepEd Order 31, s. 2012) the learning/teaching resources that are modules shall be provided as the basic learning resources of the K to 12 Curriculum. These are self-instructional materials that lead themselves to independent and cooperative learning. for schools with connectivity, web-based resources and video materials are encouraged to be used where appropriate. Resources for teachers include teaching guides, prototype lesson plans and lesson exemplars, matrix of existing books, workbooks and modules.

Moreover, Enclosure to Department of Education Order No. 42 s. 2016, on its rationale, the Department of Education recognizes that instructional planning as essential to successful teaching and learning process. Instructional planning is the process of determining what learning opportunities learners in school will have by planning "the content of instruction, selecting teaching materials, designing the learning activities and grouping methods and deciding on the pacing and allocation of instructional time".

According to Alano (2010), in the study entitled "Development and Validation of Modules in Agricultural Biology", revealed that modules are useful supplementary materials that will increase learner's performance in the subject. The lectures and activities provided in the modules were chosen and constructed to sharpen the knowledge and skills of students in Biology and Agriculture.

However, Armeth-Brothers (2007) conducted the design and development of modules for medical terminology electronic textbook. The design of the e-text conformed to establish web design recommendations including those for navigations, screen design, clarity and comprehension. It also followed instructional design principles, derived from adult learning theories and multimedia evaluations to organize content and to design learning activities. The result of the study is a prototype electronic textbook on compact disk consisting of medical terminology in anatomy and physiology content, games and drills, video scenarios, audio clips, and illustrations to be used by allied professionals.

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Dela Cruz (2009), noted that enhancement activities can also serve as a motivator and promote learners' self-assessment and self-understanding. The developed enhancement activities contributed to the improvements in the performance of the learners in Biology subject.

Furthermore, Honey M., A. and Hilton, M., L. (2011) research on Hands on Activities enhance learning significantly at all levels of science education. These activities are usually the basis for a "laboratory" class or laboratory portion of a class. In a hands-on chemistry course, learners directly experience laboratory chemicals and their properties, chemical reactions, chemical laboratory apparatus, and chemical laboratory instruments. These activities are essential for learning chemistry.

Lobarbio (2016), in her study entitled "Effectiveness of Science Intervention Materials in the Implementation of Cooperative Learning Program for Grade 8" cited that Science Intervention Materials is inexpensive and easy to get to for they are made of bond paper and it could be brought anywhere, since the activities are based on the different strategies on cooperative learning, all activities should be done by group.

More so, McAlpine and Weston (2008) in the "The Attributes of Instructional Materials"**,** describe a comprehensive list of attributes of instructional materials. The list is of particular value for two reasons. First, it is drawn from the instructional design literature and represents a consolidation of recommendations constructed by or attributed to experts for the evaluation and revision of any type of instructional material. Second, it has been validated and found reliable through a series of studies during the past five years. The study provides suggestions for how researchers and academics might use the attributes to advance knowledge in the field and how instructional designers, consultants and instructors might use the attributes to enhance their practice.

In addition to that, Jimenez (2008), in her study "Development and Validation of Laboratory Manual in General Chemistry" stated that all learners have different interests and abilities that determine what they attend to and learn. But what they learn also depends on the ability of the teachers to capture their attention and speaks their interest through the use of appropriate learning activities and media.

Figura (2016) believed that the instructional materials are the most effective way to catch the interest and understanding of the learners and help the teachers to teach them better because it aids stimulate action among students. Instructional materials indeed, help the learners to improve their academic performance and stimulate their ability to learn more. Thus, it may also aid them to increase their knowledge and skills and understand some complicated perceptions and ideas. Specifically, instructional materials provide permanent learning and teaching will prove more interesting to learning.

Portillo (2009) conducted a study on "Development and Validation of Computer-Aided Intervention Materials in Teaching Biology for Different Abled Students". The findings in the study revealed that materials that feature graphics and images of selected lessons in Science are powerful tools for learning. It is through different simulation lessons, learners experience something closely related to real life.

Scientifically Challenged Learners

Scientifically Challenged Learners can be defined as the learners having difficulties in learning scientific concepts. Meaning to say, they are the learners who did not meet expectations to pass in their academic subject particularly in Science.

Cayabyab (2009), tested the enrichment activities as Science process in teaching of Grade VI pupils with the application of enrichment activities itself. Pupils' difficulties in Science processes were addressed. It was found out in the study that there was an improvement in the learners' performance as evidence by the learning gained.

Relative to this is the study conducted by Marinas, et. al. (2007) cited that enhancement activities contain learners' activities and learners' evaluation of the strengths and weaknesses of their works. In this way, the learners could improve their performance and can support the teachers' instruction that can help the learners to have a better understanding of the lesson.

Moreover, Hanson et. al (2011) investigated the level of understanding regarding Chemistry concepts of 450 learners who took Chemistry. The investigation circled around on the concepts in acid-bases, mixtures, substances, elements and physical and chemical changes.

The result of the study revealed that the respondents have difficulties with the different concepts in Chemistry. The study recommends preparatory studies which will serve as prerequisite course before the learners took the Chemistry course to ensure their well-preparedness in learning the subject.

Dahar (2011), designing instructional tools can make teaching Chemistry more effective especially if it

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is strategically designed and aligned to the level of understanding of the learners. Supplying the needs of the learners in learning can be a factor whether teaching approaches fail or succeed. It is therefore, important that teachers have enough skills and knowledge in designing their own teaching materials.

Level of Performance

Level of performance refers to the academic performance of learners in different topics in Chemistry.

The study of Barker (2012) compared the traditional and modeling approach and it proved the positive effects of modeling instructions on the level of performance of learners in Chemistry. The analysis came out with the results that those learners who are exposed to modeling instruction approach performed better as determined by their achievement test result. It was also found out in the study that there was a deviation with respect to the attitude of the learners towards learning Chemistry.

Moreover, Soberano (2009), revealed in his study the difference in the mean score of the experimental and control groups after being exposed in Strategic Intervention Material (SIM) in Chemistry. Based on the findings, 33 learners or 100% from the experimental group had performed very satisfactory in the posttest. These data revealed that both groups had shown an increase in tests performance after they were exposed to different treatment.

According to Peñueco (2012), the level of performance is increased when learners are periodically informed of progress in their learning knowledge of successful results. A good performance or the need for certain improvement will contribute to continue motivation for learning.

Furthermore, Bautista (2016), stated that student's level of performance refers to the acquired skills after performing a certain activity. This student's learning performances reveal the learning output of the Integrated English-Filipino Learning Materials used in the enhancement of learners in a particular area.

In addition to that, Miranda (2012) revealed in her study that the scores of the learners in experimental group increased to mastered level and showed more consistent scores than the group who did not use the developed enhancement activity. It was also found out that there is a significant difference in the pretest and posttest results using the developed competency-based enhancement activities.

The study of Madrid (2014) reveals that when two groups were already established and the mean and standard deviation of the pretest and posttest scores of both groups were compared in order to prove the difference in the performance between control and experimental group, it was verified that experimental group performed better than the control group.

Abucayon (2012) in her dissertation entitled "Development and Validation of Computer-Aided Enhancement Lessons in Science 4" concluded that pupils who are engaged to experiences that promote creativity are most likely to be creative in the future that is reflective to their performance. He also recommended that the pupils should be exposed to learning activities that will developed their creative skills and public school may develop computer-based program that will enhance the creativity of both teachers and pupils.

Level of Acceptability

Acceptability refers to the validity of the objective and content, reliability, efficiency and usefulness of the constructed materials which can help learners and teachers, instructors and professors to gain knowledge. It also refers to the degree in which the teachers and experts agree to the use of the developed and validated hands on activities. The level of acceptability of the knowledge-based activities is measured in terms of objectives, content and organization and presentation.

San Juan (2007) noted and revealed that the computer aided instruction materials in the form of modules was very acceptable as evaluated by teachers and learners in terms of objectives and contents of learning activities.

According to Andres (2008), in her study on the "Development, Validation and Acceptability of Special Modules in Chemistry for Remedial Program" presented and organized the topics systematically, contents are logical and coherent, the activities are appropriate and preparation is highly efficient and acceptable that help the learners to easily understand the lesson being presented.

In addition to that, Custodio (2015), in his study on the "Development and Validation of Task-Oriented Activities with Video Presentation in Teaching Chemistry" revealed that in general the developed task-oriented activities with video presentation are very much accepted.

In the study of Somera (2015), it revealed that the developed instructional materials in reading were evaluated by the experts and learners with respect to objectives, content, language and styles, usefulness, organization and presentation are very much acceptable

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instructional materials. Since the developed instructional materials in reading are acceptable to the learners, he therefore recommends to utilize these materials by the freshmen college students as reference materials for their study and research.

Moreover, the findings of Caligua (2014), revealed that the computer-based lesson in Physics is very much acceptable and applicable to the different learning ability of the learners. The use of technology-based instructional materials to the learners with variety of learning styles and level of understanding is a characteristic of learning material that makes it useful and acceptable.

Furthermore, Orca (2014) in his study "Development and Validation of Task-Oriented Learning Activities in Physics", revealed that the developed task-oriented learning activities in Physics as evaluated by the experts were highly sufficient. Science experts agreed that the developed and validated task-oriented learning activities in Physics was accepted as an effective instructional tool in teaching the subject.

This study would be of great help to the students with difficulties since knowing that the teachers doing their best in the field of teaching. It is the fact that the students should pass all the components in Science in order to proceed in the next or higher level. Also, the teachers who are goal-directed will also benefit to this study. The variables used in the study can be the instrument in making improvement for teaching-learning process specifically by offering knowledge-based activities for scientifically challenged learners to fully understand and master the subject matter and the content of the lessons.

Through this study by means of a remediation class, scientifically challenged learners will be transformed into scientifically inclined learners who will love science specifically Chemistry because gone are the days they will realize the value and importance of Chemistry in peoples' lives.

Theoretical Framework

The study was anchored on three theories. First, is the Theory of Learning by Jerome Bruner that emphasized the role of structure of learning. He introduced the ideas of "readiness for learning" and spiral curriculum.

According to Bruner, it is believed that any subject could be taught at any stage of development in a way that fit the child's cognitive abilities. Spiral curriculum refers to the idea of revisiting basic ideas over and over, building upon them and elaborating to the level of full understanding and mastery.

Learning instructions should be well-structured in such a way that will enable the learners to readily grasp the knowledge and information present in a content areas and standards. Meaning, structuring of knowledge should be followed starting from simple up to complex ideas as embedded to spiral curriculum and progression.

The second theory is Theory of Zone Proximal Development by Lev. Vygotsky. According to him, range of tasks that are too difficult for an individual to master alone, but can be mastered with the assistance or guidance of adult or more-skilled peers. Another part of this theory is scaffolding, which is giving the learner the right amount of assistance at the right time. If the learner can perform a task with some assistance, then he or she is closer to mastering it.

The third theory is the Taxonomy of Cognitive Domain pertaining to the new version revised by Anderson and Krathwohl (2001). The first level of cognitive domain emphasizes remembering, **recognizing or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information. The second level of cognitive domain emphasizes understanding and constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining.**

The researcher used the above-mentioned theories as basis of conducting study on how every individual or learner specifically the scientifically challenged learners learn a certain lesson or topic starting with the lower level of cognitive domain such as remembering and understanding by means of learning first the simple context before proceeding to complex one with the assistance or guidance of the teacher and more knowledgeable person. It is said that experience is the best learning. The teacher should engage the learners to assess themselves on how certain activities will help them to gain knowledge and understanding about the concept considering the real-life scenario. Learning how to learn is always there at the end of the learning process.

Methodology

The following procedures were taken in gathering the data needed in the conduct of the study.

The Knowledge-Based Activities in Chemistry were designed based on the competencies of K to 12 Grade 7 Science Curriculum included topics in

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Solutions, Substances and Mixtures, Elements and Compounds, Acids and Bases and Metals and Non-metals. They were content validated by Science teachers.

The construction of Knowledge-Based Activities in Chemistry was based on the needs of the learners wherein the researcher also conducted a simple interview and survey to the identified scientifically challenged learners about their preferred strategies may be employed or applied by the teachers specifically for the learners having difficulties in learning the concepts. Based on the simple survey, it was found out that aside from the experimentation as strategy in Science, the learners also want games and puzzles in learning the concepts.

The study used the identified twenty-one (21) Scientifically Challenged Grade 7 learners as participants of the study since the identified learners got a grade of 74 and below during the first quarter. It was identified and determined through total enumeration sampling. They were chosen based on DepEd Order no. 8 S. 2015 that requires intervention.

In constructing and determining the scope of the test, the researcher considered the topics and its objectives or competencies in Chemistry for Grade 7 using the table of specifications. The researcher constructed a 100-item total of multiple choice test. The One-hundred item researcher-made test composed of 25 items in each topic such as Solutions, Substances and Mixtures, Elements and Compounds, Acids and Bases and Properties of Metals and Non-metals were subjected for item analysis and testes its reliability. Forty (40) learners from Grade 8 grouped heterogeneously were used who already took the subject to test the validity and reliability of the test and in order to determine the items to be deleted, rejected, revised and retained through item analysis. The one-hundred teacher-made test was reduced to sixty (60) items with fifteen (15) items each topic after item analysis. Revisions based on the result of the item analysis and on the recommendations of the science teachers who validated the test were made. The retained items served as the pretest while the same concept items or parallel items and competencies served as posttest. The reliability of the test was also considered using Cronbach's Alpha to determine how reliable it is.

The researcher used a modified or adapted questionnaire-checklist to determine the level of acceptability of the developed knowledge-based activities in Chemistry for Scientifically Challenged Learners of Grade 7. This was content validated by teachers in the field Science. It was administered to the experts who served as respondents in the acceptability of the developed knowledge-based activities in Chemistry for Scientifically Challenged Learners of Grade 7 using the components of acceptability with respect to objectives, contents and organization and presentation.

Prior to the exposure to the developed knowledge-based activities in Chemistry, pretest was administered to the participants. They used the developed knowledge-based activities under remediation or intervention class scheduled 11:00 am to 12:00 noon under the supervision of other Science teachers of Lagundi-CCL National High School. The remediation class is scheduled in the morning in order not to interrupt the regular time of Grade 7 learners as scheduled in the afternoon session. After exposure to the developed task-oriented activities in Chemistry, posttest was administered to the participants wherein the items have the same concept or congruent to the items in the pretest.

To determine the level of performance of the participants, the results revealed by their pretest and posttest were compared and analyzed.

All the data gathered by the researcher from testing the task-oriented activities, the pretest and posttest and questionnaire-checklist were tabulated, analyzed, interpreted and subjected to appropriate statistical tools done by the University Statistical Center for the final interpretation of the results.

Findings

This presents the results and discussion, presentation of data, analysis of data and interpretation of data gathered in order to answer specific problems.

Table 1 shows the level of performance in Chemistry of Scientifically Challenged Learners of Grade 7 before and after exposure to the developed knowledge-based activities in Chemistry with respect to the different lessons.

Table 1

Level of Performance in Chemistry of Grade 7 Learners Before and After Exposure to the Developed Knowledge-Based Activities in Chemistry with Respect to the Different Lessons

Lessons in Chemistry	Before			After		
	Mean	Sd	VI	Mean	Sd	VI
Solutions, Substances and Mixtures	4.38	2.09	FS	11.19	1.60	VS
Periodic Table, Elements and Compounds	3.95	1.99	FS	10.67	1.71	VS
Acids and Bases	4.10	2.39	FS	11.67	1.68	VS
Properties of Metals and Non-metals	4.29	1.71	FS	12.29	1.23	O
Total	**16.71**	**4.63**	**FS**	**45.81**	**3.33**	**VS**

Legend: FS- Fairly Satisfactory VS- Very Satisfactory O- Outstanding

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It can be gleaned from the table that in lesson regarding Solutions, Substances and Mixtures that based on the test result before the exposure to the developed knowledge-based activities in Chemistry the learners got the average mean of 4.38 and standard deviation of 2.09 which is verbally interpreted as Fairly Satisfactory. The results after exposure to the developed knowledge-based activities in Chemistry reveal that the learners got the average mean of 11.19 and standard deviation of 1.60 which is verbally interpreted as Very Satisfactory.

As reflected in the lesson regarding Periodic Table, Elements and Compounds, the test results before exposure to the developed knowledge-based activities in Chemistry got the average mean of 3.95 and standard deviation of 1.99 which verbally interpreted as Fairly Satisfactory. The results after exposure to the developed knowledge-based activities in Chemistry show that the learners got the average mean of 10.67 and standard deviation of 1.71 which is verbally interpreted as Very Satisfactory.

As shown in the lesson regarding Acids and Bases, based on the test result before exposure to the developed knowledge-based activities in Chemistry the learners got the average mean of 4.10 and standard deviation of 2.39 which is verbally interpreted as Fairly Satisfactory. The results after exposure to the developed knowledge-based activities in Chemistry show that the learners got the average mean 11.67 and standard deviation of 1.68 which is verbally interpreted as Very Satisfactory.

As presented in lesson regarding Properties of Metals and Non-metals, the test result before exposure to the developed knowledge-based activities in Chemistry got the average mean 4.29 and standard deviation of 1.71 which is verbally interpreted as Fairly Satisfactory while after the exposure to the developed knowledge-based activities in Chemistry shows that the learners got the average mean 12.29 and standard deviation of 1.23 which is verbally interpreted as Outstanding.

Since the standard deviation decreased from the pretest result to posttest result in all the topics, it indicates that the scores obtained by the participants were good and homogeneous.

The table shows that in all lessons, the results before exposure to the developed knowledge-based activities in Chemistry are in the same interpretation which is Fairy Satisfactory. It means that the prior knowledge of the learners or participants are not enough to get higher scores in answering test without further learning from the said lessons. But after the exposure to the developed knowledge-based activities in Chemistry the results show the increase on their mean scores and high interpretation.

The results may imply that the developed knowledge-based activities in Chemistry can enhance and improve the level of performance of the learners. The results also signify that the scientifically challenged learners really learn on the different topics with the use of knowledge-based activities. It only indicates that the learners can learn better when they are taught using different learning activities implying that the knowledge-based activities enhance the cognitive ability of the learners in Chemistry.

The present findings support the study of Dela Cruz (2009), which noted that enhancement activities can also serve as a motivator and promote learners' self-assessment and self-understanding. The developed enhancement activities contributed to the improvements in the performance of the learners in Biology as part of Science subject.

Table 2 illustrates the significant difference on the level of performance in Chemistry of Scientifically Challenged Learners of Grade 7 before and after exposure to the developed knowledge-based activities in Chemistry with respect to the different lessons.

Table 2

Significant Difference on the Level of Performance in Chemistry of Scientifically Challenged Learners of Grade 7 Before and After Exposure to the Developed Knowledge-Based Activities in Chemistry with Respect to the Different Lessons

Topics in Chemistry		Mean	Sd	Mean Diff.	t	df	Sig	H_o	VI
Solutions, Substances and Mixtures	Before	4.38	2.09	6.81	12.67	20	.00	R	S
	After	11.19	1.60						
Periodic Table, Elements and Compounds	Before	3.95	1.99	6.71	11.96	20	.00	R	S
	After	10.67	1.71						
Acids and Bases	Before	4.10	2.39	7.57	18.94	20	.00	R	S
	After	11.67	1.68						
Properties of Metals and Non-metals	Before	4.29	1.71	8.00	16.08	20	.00	R	S
	After	12.29	1.23						
Total	**Before**	**16.71**	**4.63**	**29.1**	**24.85**	**240**	**.00**	**R**	**S**
	After	**45.81**	**3.33**						

As shown in the table, on the significant difference on the performance in the lesson, solutions, substances and mixtures, periodic table, elements and compounds, acids and bases and properties of metals and non-metals the differences of the mean scores obtained

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significant values of .000. Since the computed p-values are less than or did not exceed 0.05 level of significance, the null hypothesis states that there is no significant difference on the performance of the learners before and after exposure to the developed knowledge-based activities in Chemistry. In short, the results of significant values do not favor on the null hypothesis.

The findings show that there is a significant improvement on the test results of learners after the exposure to the developed knowledge-based activities in Chemistry.

It implies that the knowledge-based activities in Chemistry help learners further understand the lessons that are included in the activity in the form of motivational activities, group activities and individualized activities since the mean score of the respondents increase significantly over their mean score during pretest after they were exposed to the developed knowledge-based activities in Chemistry. This further proves that the developed knowledge-based activities in Chemistry became successful in improving the knowledge of learners in scientific concepts.

This supports the concept that with the utilization of different learning activities, the learners' performance improved and increased which showed more consistent scores. It was also found out that there is a significant difference in the pretest and posttest results using the developed competency-based enhancement activities, so with utilizing computer-aided instruction which both noted the impact of favorable result (Miranda 2012; Estrella 2020).

Table 3 discusses the level of acceptability of the developed knowledge-based activities in Chemistry as evaluated by the teacher-respondents or experts with respect to objective.

Table 3

Level of Acceptability of the Developed Knowledge-Based Activities in Chemistry with Respect to Objective

Objective	Mean	VI
1. The objectives of the lesson are explained clearly.	5.00	Very Highly Attainable
2. The objectives of the lessons are attainable.	4.80	Very Highly Attainable
3. The objectives are based on the learning abilities of the learners.	4.90	Very Highly Attainable
4. The objectives are measurable.	4.80	Very Highly Attainable
5. The objectives are properly budgeted according to degree of competencies.	4.60	Very Highly Attainable
Over-all	**4.82**	**Very Highly Attainable**

It reveals that in terms of objective the average mean is 4.82 which is verbally interpreted as Very Highly Attainable.

The table indicates the results that the teacher-respondents come up to the verbal interpretation of Very Highly Attainable because the objectives of the knowledge-based activities were primarily explained clearly, attainable, measurable, based on the learning abilities of the learners and properly budgeted. It implies that the constructions of the objectives in different topics included in the knowledge-based activities are specific, measurable, attainable, realistic and time-bound in order to meet the target.

The study of Tambongco (2015) is supported by the present findings since Tambongco's study reported that the developed enhancement activities for Grade 7 Science as perceived by the teacher-respondents were very much accepted as instructional materials with respect to clarity of instructions which is also referred to objectives.

Table 4 describes the level of acceptability of the developed knowledge-based activities in Chemistry as evaluated by the teacher-respondents or experts with respect to content.

Table 4

Level of Acceptability of the Developed Knowledge-Based Activities in Chemistry with Respect to Content

Content	Mean	VI
1. The contents are appropriate for the lessons.	5.00	Very Highly Sufficient
2. The contents provide a clearer understanding of learning objectives.	4.60	Very Highly Sufficient
3. The contents are well presented.	4.60	Very Highly Sufficient
4. The contents are logically arranged.	4.40	Very Highly Sufficient
5. The contents are clear, attainable, reliable and based on the learning skills of the learners.	4.90	Very Highly Sufficient
Over-all	**4.70**	**Very Highly Sufficient**

It reveals that in terms of content the average mean is 4.70 which is verbally interpreted as Very Highly Sufficient.

It depicts that as evaluated by the teacher-respondents, the developed knowledge-based activities are Very Highly Sufficient. It was due to the fact that the content of the developed knowledge-based activities is appropriate to the lessons, clear, reliable, attainable and

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well-presented. It implies that the content of knowledge-based activities supports the objectives of every lessons.

The study of David (2009) is supported by the present study. Because in David's study it was found out that the developed enhancement activities are highly sufficient with respect to content with regards to the present study, the developed knowledge-based activities are very highly sufficient.

Table 5 indicates the level of acceptability of the developed knowledge-based activities in Chemistry as evaluated by the teacher-respondents or experts with respect to organization and presentation.

Table 5

Level of Acceptability of the Developed Knowledge-Based Activities in Chemistry with Respect to Organization and Presentation

Organization and Presentation	Mean	VI
1. The teaching methods used were appropriate for the lessons.	4.90	Very Highly Organized
2. It arouses the learners' interest and motivates learners.	5.00	Very Highly Organized
3. The presentation reinforces the transfer of learning.	4.80	Very Highly Organized
4. Illustrations and figures are well presented.	4.50	Very Highly Organized
5. Presentation is very clear.	5.00	Very Highly Organized
Over-all	**4.84**	**Very Highly Organized**

It reveals that in terms of organization and presentation the average mean is 4.84 which is verbally interpreted as Very Highly Organized.

It implies that the experts' perceptions with respect to organization and presentation shows variation, maybe due to the fact that presentation of the content lesson in the knowledge-based activities as instructional materials are very clear and well-presented that motivates and arouses the interests of the learners.

The result of the present study is similar to the study conducted by Sta. Maria (2015), that the developed hands-on activity with respect to organization and presentation as one of the criteria is found to be Very Highly Organized.

Table 6

Composite Table on the Level of Acceptability of the Developed Knowledge-Based Activities in Chemistry

Aspect	Over-all	VI
Objective	4.82	Very Highly Attainable
Content	4.70	Very Highly Sufficient
Organization and Presentation	4.84	Very Highly Organized
Grand	**4.79**	Very Highly Acceptable

Table 6 presents the composite table on the level of acceptability of the developed knowledge-based activities in Chemistry as evaluated by the experts.

It can be gleaned on the table that the objectives got the mean of 4.82 which is verbally interpreted as Very Highly Attainable. Meanwhile, in terms of the content the average mean is 4.70 which is verbally interpreted as Very Highly Sufficient. Organization and Presentation obtained the average mean of 4.84 which is verbally interpreted as Very Highly Organized. The overall mean of the aspect is 4.79 which is verbally interpreted as Very Highly Acceptable.

It implies that the developed knowledge-based activities in Chemistry is Very Highly Acceptable since the objective, content and organization and presentation of the said activities fall under Very Highly Attainable, Very Highly Sufficient and Very Highly Organized respectively.

The present findings support the study of Lirio (2014), that the developed supplementary learning activities were perceived very much acceptable in its objectives, content, organization and presentation.

Conclusions

From the findings of the study, the following conclusions were drawn:

1. The level of performance of the participants improved and increased after exposure to the developed knowledge-based activities in Chemistry.
2. The level of performance of the participants significantly differed after exposure to the developed knowledge-based activities in Chemistry as the test results of learners have shown significant improvement.
3. With the evaluation made by the experts, it was concluded that the remediation material possessed the characteristics of a good instructional device since it is agreed by the experts that the developed knowledge-based activities in Chemistry is very highly acceptable based on the different criteria.

Recommendations

Based on the results of the study, the following recommendations were hereby proposed:

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1. Additional intervention material as instructional materials in teaching Chemistry aside from the knowledge-based activities may be developed to further improve the performance of scientifically challenged learners.
2. Various strategies may be used in teaching Chemistry to enrich and enhance interests of the learners in learning different concepts.
3. Teachers may employ knowledge-based activities in teaching different topics in Chemistry intended for remediation.
4. The evaluation of the Developed Knowledge-Based Activities may be presented to the proper agency and experts for more sufficient evaluation.
5. Future researcher may conduct parallel study using higher contexts intended for improving the performance of the learners.

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