

THE EFFECTIVENESS OF THE “CENTER-BASED LEARNING APPROACH” IN TEACHING SCIENCE AND HEALTH

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ABSTRACT

The purpose of the study was to investigate the effectiveness of the Center-Based Learning Approach. In the Center-based Learning Approach, learners explore and discover new concepts and ideas through multiple learning centers namely: Computer Center, Art/Activity Center, Journal/Writing Center, Reading Center and Manipulative Center. It relies heavily on computer-aided learning modules and richly illustrated lessons. This approach made learning enjoyable, encourage learner to use his imagination and critical thinking and develop multiple intelligences as different learning styles and preferences are catered (Apat,2004). This research used as a quasi-experimental research design comparing the Center-based Learning approach with a Conventional Teaching Approach. It also sought the perception of teachers as to its effectiveness to the learning capabilities of the pupils. A 50- item-multiple choice knowledge pre-test and post-tests were given. The mean ratings of performance test between the two groups were computed. The researcher used ANCOVA in finding the difference of the performance of the two intact Grade Six classes. The analysis of Covariance Results showed that the performance of the Grade VI pupils in Science and Health subject when taught with Center-Based Learning Approach and Conventional Approach, differ significantly. The observed significant level which is $<.0005$ is less than $.05$ which led to the rejection of the null hypothesis which means there is significant difference on Grade VI pupils' performance in science subject. Between the two approaches, the Grade VI pupils performed better when exposed to Center-Based Learning Approach than when pupils were exposed to the Conventional Approach. The researcher computed the mean of the responses of teachers on their perception of CBLA based on the Productive Pedagogies Framework for Classroom Reflection criteria of the Department of Education and Technology, Queensland, Australia. The questionnaire includes observable behaviors related to the five characteristics of an effective and productive pedagogy. As assessed by the public school teachers, all the characteristics and behaviors of a productive pedagogy were observable in all the centers of the Center-Based Learning Approach. The elementary public school teachers perceived that the CBLA is an effective approach in teaching elementary Science & Health subject. It possesses the characteristics that influenced effective teaching and high learner performance. It is therefore an effective approach in teaching. It is recommended for utilization and application in teaching of Science and Health subject in the Department of Education (Deped).

Key words: *Pedagogy, teaching science, Center-Based Learning Approach, integrating ICT in teaching, quasi-experimental design research, innovative approach, Philippines*

1. Introduction

Science is perceived to be of importance because of its link to technology and industry. From a national perspective, it is an area with high priority for development. Consequently, science is included as a core element in elementary and secondary curriculum despite conceptual complexity and high cost of implementation. The inclusion of science in the curriculum supports the idea that all

citizens need to achieve a degree of “ scientific literacy” to enable them to participate effectively as citizens in modern societies (Dimaano 2012). Studies indicated however that many of the Filipino learners are not attaining functional literacy, without which they find it too difficult to meet the challenges posed by the rapidly changing world (EDCOM 1991).

Student’s performance in the National Achievement Tests (NAT) shows that aside from Mathematics, Science continues to be the most difficult field of study in basic education. As for NAT result of Second Year High School in 2010-2011, pupils gave correct answers to less than 50% of the questions in Science (35.91%) and in Mathematics (37.83%) (DepEd 2011).

In the Third International Mathematics and Science Study (TIMSS), the Philippines ranked 36th in 2nd year high school Science out of 38 countries. By 2003, the country ranked 23rd in Grade IV Science among 25 countries. The country then started talking about a crisis in the Philippine educational system. In the high school level, Philippines ranked 42nd and in 2nd year Science, among the 45 countries. The Philippines did not participate anymore in the 2007 TIMSS (Dela Cruz 2012).

There were fewer topics in the Science syllabi of countries with high achievement in the Third International Mathematics and Science Study (TIMSS). In the Philippines, the national mean score in Science was only 35.91% in the 2011 National Secondary Achievement Test (NSAT). This indicated that this was a difficult subject for the students, and for which additional contact time is needed and innovative teaching techniques should be devised (DepEd 2011).

The main factors to be accounted for the low performance in Science of the Filipino students included the lack of Science culture and deficiencies regarding the school curriculum, the teaching-learning process, the instructional materials and teacher training (Batomalague 2010).

Salandanan (2012), believed that effective teachers should conduct a consistent and systematic review of their educational practices and problems and try new ways of doing things. The teaching-learning process is interactive where learners, the teachers, instructional materials and information technology interact with one another. Learning is assessed using a variety of measures in which its purpose is to gather information about the learners’ progress in holistic terms. The restructured curriculum involves innovative, interdisciplinary and integrative modes of institutional delivery.

The status of Science education and the aspirations of younger people towards a career in Science greatly vary between countries and regions. A number of global large-scale surveys involving students from developed as well as the emerging and less developed countries carried out by the Organization for Economic Co-operation and Development (OECD, the PISA study), the International Association for the evaluation of Educational Achievement (IEA, the TIMSS studies) and the Norway-based International Relevance of Science Education (ROSE) project provided useful data on the quality of science education as well as the interest of young people towards science in many countries. Basing on their studies, there is great relationship between nurturing high performance and tackling low performance, and that excellence in mathematics and science requires excellence in reading (ICSU 2011). It is also clear that ICSU and its Members learned valuable lessons about effective approaches to science education in a wide range of countries and cultural contexts from such studies.

Comparative data on the achievement scores (PISA, TIMSS, etc), as well as on attitudes (such as ROSE) suggested that a scientific community, innovative approaches that incorporate and recognize factors that motivate students should be experimented, discovered and developed to successfully engage a larger fraction and a more diverse youth in this uniquely productive discipline.

There is a need to upgrade teachers' capabilities in most countries, especially as regards content and pedagogy, in facilitating hands-on activities for science lessons, as well as on the introduction of contemporary technologies to enhance student learning in science. While countries vary in their process for preparing future teachers, some with specialization in science and some without, they all express a need for the adequate training for their teachers. The situation is particularly pressing with respect to teachers at primary and secondary school levels for it is in these levels where the foundations for an inquiring mind of basic concepts are laid. An educational institution's most important asset is its teaching staff. There is an urgent need for better training of teachers at all levels in order that they can not only provide accurate information to their students, but also do it in a manner that fires. Teachers' pedagogical and subject knowledge is critical to effective teaching. Unfortunately, in most countries around the globe, teacher preparation in science and mathematics is woefully their imagination and fosters curious and analytical minds (ICSU 2011).

Learning and teaching are inseparable. Continuous learning by teachers is essential, especially in view of the dynamically changing concepts and information in different branches of science. Therefore, continuous high-quality professional development of teachers is essential for good educational outcomes for their students like: deepening and broadening of knowledge of science content; modeling the teaching of new content as well as best teaching practices like inquiry, constructivism, integration of multiple intelligence theory, authentic assessments, etc.; preparing teachers on how to engage their students in scientific investigations; encouraging teachers to share successful teaching methods and materials that they have, either developed by themselves or are using from other source; providing the opportunity for teachers to participate in courses on continuing education, science specializations, or towards a graduate degree; or integrating science with technology (ICSU 2011). The current explosion of web-based educational resources are now available on line. Some are available as 'Open Educational Resources' (OER). A large number of portals dedicated to the sharing of science education innovations , experiences and educational materials are now available.

On the other hand, the researcher is with the idea of ICSU (2011) and Salandanan (2012), that effective teachers should conduct a consistent and systematic review of their educational practices and problems and try new ways of doing things. In the year 2002, the researcher got synergistic tandem with IBM Philippines (provider of computer hardware and software) to model a new way of presenting lessons through integrating technology. The new pedagogy, "The Center-Based Learning Approach" authored by the researcher, (Apat 2004), features its application on enhancing learners' multiple intelligences and catering different learning styles and preferences of learners. It is an innovation in the teaching and learning process and is virtually new to a third world country like the Philippines. This teaching approach utilized not direct instruction; rather, the centers give learners opportunities to construct their own knowledge through exploratory, investigatory, experimentation and experiential activities which are planned, created and provided by the teacher. It integrates computer technology as a tool to aid in the development of learning. The computer center relies heavily on computer-aided learning modules, interactive curriculum software and information and communication technology (ICT). Using this approach, the lessons are made enjoyable and fun. Learners are transformed into empowered and autonomous ones who are always using their imagination and higher-order thinking skills as they construct and reconstruct new knowledge. It shows an example of how a teacher becomes a catalyst of learning, a facilitator, instead of previous role, as sole provider of knowledge and information. This approach also shows how a learner's multiple intelligences are honed producing a versatile individual (Apat 2004). The Center-Based Learning Approach is applicable across subjects in the curriculum and in all ladders of education: elementary, secondary and tertiary.

In the Center-Based Learning Approach, one has to learn new knowledge through exploration on the multiple learning centers namely: the Computer Center, Art/Activity Center, Journal/Writing Center, Reading Center and Manipulative Center. The Computer Center uses computer as ICT or Information Communication Technology. It relies heavily on computer-aided learning modules and richly illustrated lessons. The nature of learning in the different centers features constructivism of Piaget, Vygotsky, Bruner and other constructivists. The five centers develop and enhance the multiple intelligences of the learners and learning is according to their learning styles and preferences. The researcher has disseminated the approach to her student teachers and teachers in in the different schools of the Department of Education (DepEd) for quite a time using varied interactive curriculum software for elementary, secondary and tertiary levels but there was no formal research conducted yet as to its effectiveness.

The researcher would like this time to investigate and assess the effectiveness of the pedagogy, "The Center-Based Learning Approach" in its application to Science subject in the elementary level in particular. The researcher wanted to find out if CBLA is a procedure that access better understanding and effective learning.

The role of methods in teaching is of paramount importance. Teachers who envision a fruitful and enjoyable teaching career recognize and accept said dictum. It is so fulfilling and gratifying for a teacher to develop competence in deciding on a method to use and implementing it successfully (Salandanan 2009). Teachers therefore should know the factors that affect decisions on what method or approach to use.

2. Framework and Objectives of the Study

This study evaluated the effectiveness of the pedagogy, "The Center-Based Learning Approach through comparing the performance of the two intact Grade VI elementary pupils in Science and Health subject after exposure to two approaches, the Center-Based Learning Approach and the Conventional Approach in teaching during the 2nd Semester of AY 2012-2013.

The study investigated also the perception of the elementary public school Science teachers on the effectiveness of the Center-Based Learning Approach to the learning capabilities of the pupils based on the Productive Pedagogies Framework for Classroom Reflection criteria of the Department of Education and Technology, Queensland, Australia. The framework includes five characteristics of an effective and productive pedagogy.

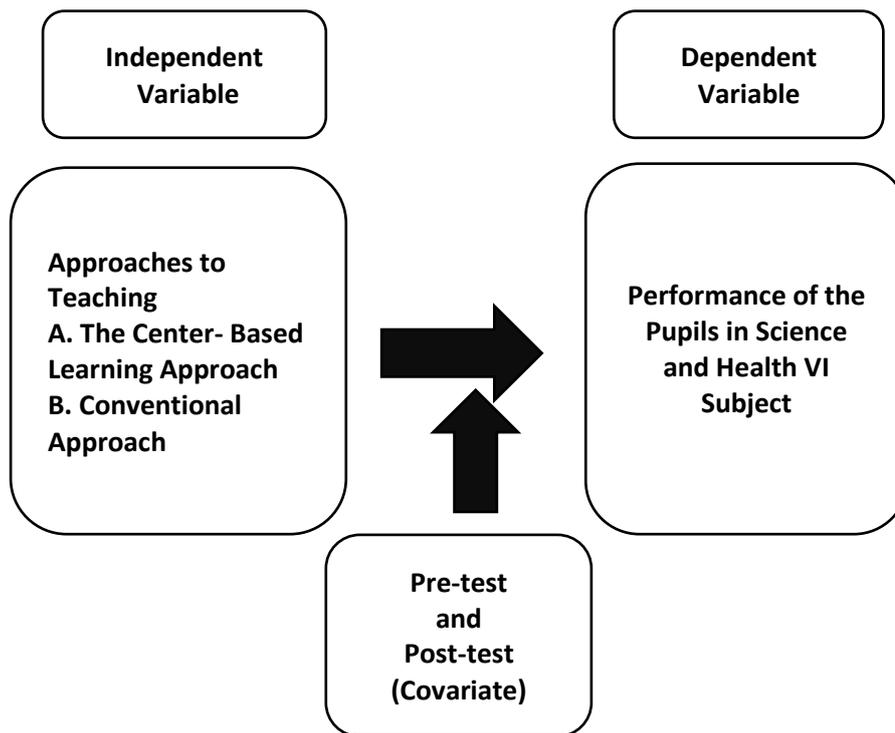


Figure 1. Research Paradigm

It answered the following questions: 1. What is the performance of the Grade VI elementary pupils in Science and Health subject when exposed to Center-Based Learning Approach and the Conventional Approach? 2. How do the performance of elementary Grade VI learners compare in the Science and Health subjects when exposed to Center-Based Learning Approach and Conventional Approach? 3. What is the perception of the Elementary Public School Science Teachers on “The Center-Based Learning Approach” on the following pedagogy reflection criteria? 3.1 Highly-Intellectual Tasks and Activities; 3.2 Supportive Learning Environment; 3.3 Recognition of Learner’s diversity; 3.4 Connectedness to a wider Social Context; 3.5 Supported by Virtual Experiences.

3. Materials And Methods

The study used the Quasi-Experimental Research Design. There were two sets of grade VI intact classes, the control group applied with the Conventional Approach and the experimental group applied with the Center-Based Learning Approach. The data gathering tool used in this study was the 50-item knowledge test conducted as the pre and post-test during the third grading period of DepEd calendar year 2012-2013, third quarter. The test covered learning competencies found in the Grade VI Third Grading Science Learning Continuum. The fourteen (14) third grading learning competencies covered topics about volcano, volcano eruption, earthquake due to volcano eruption, effects of eruption, precautionary measures before, during and after volcanic eruption, climate and its types. The test is composed of 50 items which includes 60% easy (30 items), 30% average (15 items) and 10% difficult (5 items) category percentage. The test items were shown and reviewed by ten teachers of East Prosperidad Central Elementary School, and East Prosperidad SpEd School, Division of Agusan del Sur. Before the test was given to the respondents, permission to conduct the study was secured from the school division Superintendent of DepEd Agusan del Sur. After which, it was presented to the district supervisor and school principals of the schools where the subject and respondents were located. The test was administered personally by the researcher. The researcher used ANCOVA in finding the difference of the performance of the two Grade Six classes exposed to CBLA and Conventional Approach.

The researcher computed the mean of the responses of teachers on their perception of CBLA. Ten (10) teachers from the Department of Education (DepEd), in the Division of Agusan del Sur during the Academic Year 2012-2013 assessed and investigated the effectiveness of Center-Based Learning Approach based on the criteria presented in the Productive Pedagogies Framework for Classroom Reflection of Department of Education and Technology (DET), Queensland, Australia in the year 2002 on the following criteria: a. Highly- Intellectual Tasks and Activities, b. Supportive Learning Environment, c. Recognition of Learners' Diversity, d. Connectedness to A Wider Social Context and e. Supported by Electronic or Virtual Experiences. The questionnaire includes observable behaviors related to the five characteristics of an effective and productive pedagogy.

4. Results And Discussion

1. The performance of the Grade VI elementary pupils in Science subject when exposed to the Center-Based Learning Approach and the Conventional Approach.

The mean performance of the experimental group who were exposed to the Center-Based Learning Approach for one grading period, increase (table 1) from 10.77 to 36.14 with SD from 2.06 to 4.67. The mastery level improved from 21.54% to 72.28% which is higher than the DepEd mastery level standard.

After the Grade VI control group pupils were exposed to Conventional Approach of teaching Science Grade VI for one grading period, its mean performance increased from the mean of 12.20 to 28.64 with SD from 1.69 to 4.30. There was mastery level increased from 24.40% to 57.28% which was higher than DepEd Mastery Level Standard (50%), as shown in table 1.

2. The comparative performance of the elementary Grade VI learners in science subject after exposure to Center-Based Learning Approach and Conventional Approach.

The covariate which is the pre-test showed that the performance scores of the experimental group and control group were not significant which means that they have the same performance. Moreover, the $R^2(.420)$ indicated that 42% of the variance in the observed performance scores could be explained by the teacher methods used.

Table 2, Analysis of Covariance Results, showed that the performance of the Grade VI pupils in Science subject when taught with Center-Based Learning Approach and Conventional Approach, differ significantly. The observed significant level which is $<.0005$ is less than $.05$ which led to the rejection of the null hypothesis which means there is a significant difference on Grade VI pupils' performance in Science and Health subject. Between the two approaches, the Grade VI pupils perform better when exposed to Center-Based Learning Approach than when pupils are exposed to the Conventional Approach.

3. The perception of the elementary public school teachers on the "Center-Based Learning Approach" based on the following pedagogy reflection criteria:

a. Highly-Intellectual Tasks and Activities

In the Computer Center, Journal/Writing Center and Reading Center, 100% of the teacher agreed that pupils were doing learning tasks and activities which were of high-intellectual quality. In the Art/Activity Center, 97% only and in the Manipulative Center, 98% of the teachers agreed that pupils were doing learning tasks and activities which were of high-intellectual quality. It is because in these centers, aspects of language, grammar and technical vocabulary were not so given prominence.

b. Supportive Learning Environment

100% of the teacher respondents agreed that all the centers namely: Computer, Art/Activity, Journal/Writing, Reading and Manipulative Centers were supportive of pupils' performance may it be physical, psychological or social learning environment.

c. Recognition of Learner's Diversity

In the four centers namely: Computer, Art/Activity, Journal/Writing, and Manipulative, 100% of the teacher respondents agreed that the diversity of the pupils were being recognized. Socio-cultural backgrounds or cultural diversity was being valued too. But in the Reading Center, 96% only agreed because some believed that good and original ideas originated and discovered by the class were not so given positive recognition. It is because in the reading Center, pupils were more exposed to authors and proponents of theories and ideas than discovering new knowledge.

d. Connectedness to a Wider Social Context

100% of the teachers agreed that all centers-computer, Art/Activity, Journal/Writing, Reading and Manipulative Centers possessed the capacity to make lesson connections to a wider social context. Lessons were made relevant and applicable to the needs of the times and connected to real-life situations.

e. Supported by Electronic or Virtual Experiences

100% of the teacher respondents agreed that the Computer Center was supported by virtual experiences through exploration in Information Communication Technology (ICT), interactive curriculum software and computer-aided lessons. None availability of electronic technology were noted for the rest of the centers.

As assessed by the public school teachers, all the characteristics and behaviors of a productive pedagogy were present and observable in all the centers of the Center-Based Learning Approach.

According to Apat (2004), the Center-Based Learning Approach is creating and expanding opportunities for different learning styles and intelligences as well as teaching practices while coping with this rapidly changing world. The classroom is seen as community of learners engaged in activity, discourse and reflection. It creates an environment where learners develop real-life skills such as time management, cooperation, responsibility, and flexibility. Empowering learners to think by themselves makes them skillful and autonomous learners.

Bottini and Grossman (2005) also shared that classroom which utilizes learning centers not only provide children with opportunities to explore, experiment, and construct their own knowledge, they also provide opportunities for movement, socialization, choice making, responsibility, and problem solving. They stated further that art, music, and movement activities in the centers allowed expressions of thoughts and feelings, and relieve stress while encouraging creativity.

According to the demonstrator, Mrs. Tita U. Gavino and the teacher observers of EPCES, in the center-based activities, good ideas are originated and derived from the pupils; pupils were motivated; it developed higher-order thinking skills; there was interaction between pupils and teachers; it was learning by doing instruction; the output demonstrated a clear understanding of the concept; the task and activities regulated pupils' behavior, the lesson was backed-up by ICT; the lesson developed writing skill; it was hands-on-minds-on activity; there were opportunities for pupils to connect prior knowledge; knowledge was made clear and concrete; good ideas are given positive recognition and the classroom atmosphere was democratic.

According to the study of an approach in teaching by Patel (2003), an effective approach leads to a stimulating learning environment which influences and inspires critical learners. Ownership of knowledge is vital in the learning process because it provides confidence and a sense of participation in the knowledge community, leading to independence. He stated further that an approach should accommodate and recognize different kinds of students and varying ethnic groups. The modern university, especially in a multi-cultural and open society, needs to be able to meet the needs of a diverse student population.

Philosophers such as Plato and Rousseau argued that education had to address multiple dimensions of the individual while relating the person to society. According to Campbell (2011), educators could adapt a wide variety of lessons with traditional and new media; address post-modern educational concerns such as multiculturalism, diversity of perspectives, respect for the individual learner, and critical thinking as strategies for helping students; encourage intellectual inquiry, embrace imagination, promote social change and transformation, and help people to live peacefully with one another.

According to Rateliff Barr (2013), students benefit from learning center instruction because it encourages independent learning, social interaction and multi-sensory learning while teaching problem-solving skills and engaging children in the learning process. Center instruction offers opportunities to move around, make choices and encourage individual responsibility. Learning centers can include online websites offer interactive learning center activities in Science, reading, Mathematics and other subjects. Teachers can use these sites in class or recommend them to parents for use at home.

According to Apat (2004), in CBLA, the learners initiated their own learning pace and took more responsibility in the learning process. In the traditional learning milieu, pupils are more likely to be passive listeners. This approach allowed pupils to explore a wealth of information as much as technology would allow. The teacher's lessons were enriched with sound, moving images and colorful graphics in the computer center. Finally, the teacher, previously perceived to be the sole provider of knowledge, has been significantly transformed into a catalyst who coordinated the achievement of a creative and active learning environment. It is in accord with the new view of teaching where the teacher becomes the facilitator who is creator and provider of active creative learning environment for the learners and the learners are treated as dynamic makers of new knowledge. Teachers are not direct transmitter of knowledge and learners are not just mere receivers of new knowledge and information.

5. Conclusions

1. The Center-Based Learning Approach was capable of producing better learning performance in teaching than the Conventional Approach in teaching Science subject in the elementary grades. The Center-Based Learning Approach therefore is an effective approach in teaching elementary Science and Health subject.

2. The teachers perceived that the CBLA is an effective approach in teaching elementary Science and Health. The Center-Based Learning Approach possesses the characteristics that influenced effective teaching and high learner performance. It is therefore an effective approach in teaching.

6. Recommendations

1. The Center-Based Learning Approach possesses the characteristics of a productive and effective pedagogy. It is therefore recommended for utilization and application.

2. The teachers of DepEd should utilize the pedagogy, The Center-Based Learning Approach in teaching if they aimed for better performance of their pupils.

3. In deciding what approach, method, strategy or technique to choose and use in teaching, teachers should base decisions by using the productive pedagogy reflection criteria used by the researcher.

7. Avenue For Further Research

1. The effectiveness of CBLA in teaching other disciplines in the elementary level like Mathematics, English, Makabayan, and Filipino.
2. The application of CBLA in enhancing learners' multiple intelligences in secondary and tertiary level.
3. The effect and application of electronic learning resources in enhancing learning.
4. The facilitator role of the teacher vs educational technology
5. Virtual Experiences and Multiculturalism

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