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Interdisciplinary Contextualization and Inquiry-Based Learning: How Engaging Can It Be?

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Abstract- The imperative that the state, through the implementation of the Enhanced K to 12 Curriculum, will provide a science education that is globally competitive, constructive, inquiry-based, and contextualized immediately places the onus to the teachers to enhance the teaching-learning process. This mixed-method sequential exploratory research was conducted in Zamboanga del Sur National High School. The case study explored students' perceptions on the incorporation of Interdisciplinary Contextualization and Inquiry-Based Approach. The qualitative analysis revealed that the student-participants reciprocally agreed they have gained more knowledge. They perceived that the incorporation of Interdisciplinary Contextualization and Inquiry-Based Approach affords connection of situations and problems to other learning areas, promotes critical thinking and deeper understanding of content, provides opportunity to interact with one another and perform real-world activities. They also articulated common problems/challenges they encountered like time constraint in doing the different activities, readiness of the students to learn through the integration of the said approaches, the availability of reference materials, and the preparation of materials as well as the conduct of experiments which might require much time and effort. However, they emphasized that the use of Interdisciplinary Contextualization and Inquiry-Based Approach should be fully implemented by more teachers. The validated Students' Science Engagement Scale (SSES) was also used to describe students' engagement. To test the statistically significant difference on students' engagement before and after the use of the integrated teaching approaches, paired samples t-test was employed. It revealed a no significant difference during the first trial run but with a highly significant difference during the second trial run. This finding implied that students' level of engagement in learning Science has significantly increased through the long-term utilization and assimilation of Interdisciplinary Contextualization and Inquiry-Based Approach.

Keywords- *Engagement, Inquiry-Based Approach, Interdisciplinary Contextualization*

I. INTRODUCTION

The science curriculum framework of the Enhanced K to 12 Basic Education Program strongly advocates the philosophy of constructivism, multidisciplinary/ interdisciplinary approach, contextualized learning, and inquiry-based approach. Interdisciplinary approach in teaching Science implies relating to or combining more than one branch of knowledge or field of study. Contextualization, being backed up by the educational philosophy of constructivism, claims that knowledge is constructed within the human minds and social communities. Contextualizing the lessons means placing ideas, situation, events, or items in their larger setting and embedding the facts and theories in the cultural, historical, ideological fabric and/or personal experience. Further, contextualized approach in teaching implies relating subject matter content to meaningful situations that are relevant to students' lives. Being inquiry-based, the teaching-learning process of science in the Enhanced K to 12 Curriculum would allow the students to make connections, draw conclusions or generalizations, explore and work cooperatively, discuss and debate, express knowledge in a variety of ways, and use multiple intelligences so that they will become engaged and empowered learners who can take ownership of their own learning (K to 12 Toolkit, 2012; K to 12 Science Curriculum Guide, 2013).

Inquiry-based and contextualized teaching approaches accentuate student structured learning rather than teacher-transmitted information. These approaches are more student-centered and exploratory, with the teacher as facilitator of learning. Thus, there is more emphasis on "how we come to know" and less on "what we know" (Concept to Classroom http://thirteen.org/edonline/concept2class/inquiry/index.html).

Research says that the mind logically seeks meaning in context by probing for connections that seem useful and relevant. Learning, as decorated by numerous studies, transpires only when learners process knowledge or new information through their own frames of reference specifically their own terms of reaction, memory, and experience (K to 12 Toolkit, 2012). Experts of the field of education postulated that interdisciplinary connections promote accomplishment of the students making learning easier, more realistic, and more useful (Shell et al., 2010; Karsten & O'Connor, 2002). Teaching and learning process that emphasize incorporating contextualized situations, connecting concepts/skills within and across learning areas such as Math and Science dramatically improves learners' involvement and performance (Chernus & Fowler, 2010). When students learn things that are close and relevant to their daily living, their interests are engrossed and maintained (Goode, 2000; Simpson & Nist, 2002). Inquiry-based techniques foster students' understanding of the

scientific method, develop critical thinking skills, provide opportunities to engage and practice activities involved in science (Cavallo et al., 2004; Apedoe, Walker & Reeves, 2006; Meyer & Crawford, 2011). In short, if we combine interdisciplinary contextualization and inquiry-based strategies in teaching and learning Science, research says that it helps students learn better.

The imperative that the state, through the implementation of the Enhanced K to 12 Curriculum, will provide a science education that is globally competitive, constructive, inquiry-based, and contextualized immediately places the onus to the teachers to enhance the teaching-learning process in every classroom to initiate progress towards this goal. Along these premises, the researcher was challenged to conduct this study to explore the effects of reinforcing interdisciplinary contextualization and inquiry-based approach in teaching Science to students' engagement on the learning process. This study also aimed to look at how students perceive the utilization and intermingling of interdisciplinary contextualization and inquiry-based approach in teaching Science. Specific objectives of this investigation were to (1) explore students' perceptions on the use of interdisciplinary contextualization and inquiry-based approach in learning Science; (2) describe students' level of engagement in the learning process; and (3) determine how interdisciplinary contextualization and inquiry-based approach affect students' engagement in Science.

II. Materials and Methods

This study employed mixed methods of research particularly sequential exploratory design to explore the implementation of interdisciplinary contextualization and inquiry-based approach in teaching Science and investigate the effects of the integrated approaches to the level of students' engagement in the learning process. This research design is characterized by an initial phase of qualitative data collection and data analysis trailed by a phase of quantitative data gathering and exploration (A Quick Guide To Research, 2016).

A research instrument used in the qualitative case study is questionnaire for structured individual interview, focus group discussion, and essay writing prepared and developed by the researcher allowing the research participants to express their thoughts, feelings and opinions regarding the inquiry. The validated Students' Science Engagement Scale (SSES) was another instrument used for the quantitative study. The scale was used to describe the level of engagement of students on the learning process when they were taught with and without the reinforcement of interdisciplinary contextualization and inquiry-based approach.

Teaching-learning guides for Grade 8 Science particularly Unit 1 Module: 1 Forces and Motion and Module 2: Work and Energy were also designed to explore the utilization of interdisciplinary contextualization and inquiry-based approach in learning Science.

As an essential step of data gathering procedure, the researcher reminded the research participants about the purpose and significance of the study, risks and benefits of the case study, and involved commitment and protection of confidentiality. Participants were provided with the informed consent as a preliminary step of data collection. After ensuring that the participants have clear perspective and understanding about the study, the researcher asked permission from the respondents on the audio recording of the interviews and focus group discussions for later transcription and analysis. The transcription of students' responses followed right after the data collection.

The collected data on students' engagement were analyzed by applying descriptive statistical measures such as mean as a measure of average and standard deviation as a measure of variability of numerical data. To test the significant difference at the 0.05 level of significance in the students' engagement, the test for repeated measures Paired Samples T-test was employed.

III. Results and Discussion

Based on the data gathered from individual interviews, focus group discussion, and essay writing, the students from the two groups representing Case 1 and Case 2 expressed their different views about the implementation and integration of Interdisciplinary Contextualization and Inquiry-Based Approach.

Case 1: The Use and the Benefits Obtained from Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. Based from the data gathered, the student-participants from Case 1 agreed that the use of Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach helped them learn easier and better because they can share and elaborate their ideas with their teachers and their classmates. It gave them the opportunity to interact with one another, to perform real-world activities, to demonstrate their skills and understanding, and to make connections between what they already know and their new learning from different perspectives. They perceived Interdisciplinary Contextualization as a link of their knowledge to other learning areas. That is why the incorporation of these teaching approaches allowed them not only to widen their knowledge and sharpen their thinking but also to facilitate learning certain topic in Science that is connected to a lot of other topics.

Research findings indicated that learning occurs only when students process knowledge or new information through their own frames of reference specifically their own terms of reaction, memory, and experience (K to 12 Toolkit, 2012). Contextualization has potential to increase and solidify the performance of students by making learning more active and generalizable (Perin, 2011). Moreover, inquiry-based instruction provides students the opportunity to raise inquiries, interact with other learners, and put intellectual experiences in communicable form (Eisenkraft, 2003).

Case 2: The Use and the Benefits Obtained from Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. Based from the collected data, the student-participants from Case 2 emphasized that they have gained

more knowledge because of the use of Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. They considered the integration ICon and IBA as learning and teaching method that provides students questions, ideas, and analysis. It relates situations and problems to the real-world and promotes critical thinking and deeper understanding of the content. They perceived Interdisciplinary Contextualization as a form of active learning that helps them understand easily by connecting/linking concepts and skills. They also considered Inquiry-Based Approach as fundamental for the development of higher order thinking skills. Indeed, the integration of these teaching approaches allowed the students to become more active in learning Science.

Experts of the field of education postulated that interdisciplinary connections promote accomplishment of the students making learning easier, more realistic, and more useful (Shell et al., 2010; Karsten & O'Connor, 2002). Considering that the learner is the center of educational activity, learning should be directly related to the interests and contexts of the learner (Dupuis et al., 2008). When students are engaged in inquiry-based learning, they should be engaged in scientifically-oriented questions, evaluate explanations, and communicate and justify their proposed explanations which all require higher-order thinking skills (National Research Council, 2000).

Case 1: Problems/Challenges in the Implementation of Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. In this study, the problems/challenges in the implementation of ICon and IBA were also looked into. Case 1 stipulated a number of problems/challenges in the implementation of Interdisciplinary Contextualization as well as the Inquiry-Based Approach in learning Science. The most common problem encountered by the students is the time-consuming activities and assessment. Numerous formative and summative assessments might overburden the students at the same time consume a lot of time in their Science class. Another problem stipulated by the students is the availability of reference materials to enrich their learning and supplement the Science Learner's Module. The readiness of the students to go through inquiry-based learning that involves exploring, discovering, and searching for new understandings also posed a challenge to them. Some students are unprepared and some are not participative.

Case 2: Problems/Challenges in the Implementation of Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. When students from Case 2 were asked about the problems/challenges in the implementation of ICon and IBA, they emphasized time constraint in doing the different activities as a major problem/challenge in the implementation of Interdisciplinary Contextualization and Inquiry-Based Approach followed by students' readiness to learn through the integration of the said approaches. Sometimes, they have difficulty in answering questions that require higher-order thinking skills. These problems could hinder students' active participation in the class activities and may possibly result to poor performance. Preparation of materials as well as conducting experiments might also require much time and effort.

Table 1 displays students' level of engagement in learning Science before and after the incorporation of Interdisciplinary Contextualization and Inquiry-Based Approach. The overall level of engagement in learning Science even before the integration of ICon and IBA is high (M = 3.24; SD = 0.63). With the use of ICon and IBA, the students exemplified a very high level of engagement during the first and second trial runs (M = 3.34; SD = 0.58 and M = 3.46; SD = 0.50). Strikingly, all constructs namely Engagement on Science Lessons and Tasks, Science Learning Involvement and Science Effort and Preparation consistently displayed means interpreted as very high.

TABLE I. DESCRIPTIVE STATISTICS OF STUDENTS' LEVEL OF ENGAGEMENT IN LEARNING SCIENCE

Constructs	Before icon and iba			After icon and iba (first trial run)			After icon and iba (second trial run)		
	$\bar{x}$	SD	Remarks	$\bar{x}$	SD	Remarks	$\bar{x}$	SD	Remarks
Engagement on Science Lessons and Tasks	3.34	0.60	Very High	3.45	0.56	Very High	3.53	0.49	Very High
Science Learning Involvement	3.20	0.66	High	3.30	0.60	Very High	3.43	0.50	Very High
Science Effort and Preparation	3.19	0.62	High	3.29	0.58	Very High	3.42	0.50	Very High
Overall	3.24	0.63	High	3.34	0.58	Very High	3.46	0.50	Very High

Scale: 1.00 - 1.75 -Very Low; 1.76 - 2.50 - Low; 2.51 - 3.25 - High; and 3.26 - 4.00 – Very High
Note: ICon – Interdisciplinary Contextualization; IBA – Inquiry-Based Approach

Table 2 shows the results in determining the significant difference on students' engagement with and without the use of Interdisciplinary Contextualization and Inquiry-Based Approach through paired samples t-test. The hypothesis was tested at the 0.05 level of significance. The table (t-value = -1.52; p-value > 0.05) reveals that there is no significant difference between the level of students' engagement before and after ICon and IBA during the first trial run.

TABLE II. TEST OF SIGNIFICANT DIFFERENCE ON STUDENTS' ENGAGEMENT WITH AND WITHOUT (FIRST TRIAL RUN)

First Trial Run Variables	N	t – value	df	p – value
Before Interdisciplinary Contextualization and Inquiry-Based Approach	83	-1.52	163	0.130
After Interdisciplinary Contextualization and Inquiry-Based Approach	83			

* Significant at the 0.05 level

By employing Paired Samples T-test, Table 3 indicates the test of significant difference in students' engagement in learning Science with and without the use of Interdisciplinary Contextualization and Inquiry-Based Approach during the second trial run. The table (t-value = -4.39; p-value < 0.05) reveals that there is a high significant difference between the level of students' engagement before and after ICon and IBA during the second trial run.

TABLE III. TEST OF SIGNIFICANT DIFFERENCE ON STUDENTS' ENGAGEMENT WITH AND WITHOUT (SECOND TRIAL RUN)

Second Trial Run Variables	N	t – value	df	p – value
Before Interdisciplinary Contextualization and Inquiry-Based Approach	83	-4.39	130	0.000
After Interdisciplinary Contextualization and Inquiry-Based Approach	83			

* Significant at the 0.05 level

This finding signifies that students' level of engagement in learning Science has significantly increased through the long-term utilization and assimilation of Interdisciplinary Contextualization (ICon) and Inquiry-Based Approach. This warrants the claim that ICon and IBA implementation could enhance students' engagement in the teaching-learning process.

Several researches theorized the positive impact of interdisciplinary contextualization and inquiry-based approach in teaching to students' engagement in the learning process. A student in a supportive learning environment which provides an opportunity to express curiosity and become involved in the learning process will always succeed and engage more than a student who is subjected to a threatening environment or lack of stimulation (Dotterer & Lowe, 2011). Students' engagement in their school tasks surges significantly when they are taught why they are studying and stressing the concepts and how those concepts can be used in real-world contexts (Chernus & Fowler, 2010; K to 12 Toolkit, 2012; K to 12 Science Curriculum Guide, 2013). Inquiry-based pedagogy provides students with opportunities ad platforms to engage and run-through the learning activities in science (Apedoe, Walker, & Reeves, 2006). When students learn things that are close and relevant to their daily living through the use of authentic materials, their interests and engagement are engrossed and maintained (Goode, 2000; Simpson & Nist, 2002).

IV. CONCLUSION AND RECOMMENDATIONS

This study has arrived to the conclusion that the implementation and incorporation of Interdisciplinary Contextualization and Inquiry-Based Approach in learning afford students connection of situations and problems to other learning areas, promote critical thinking and deeper understanding of the content, and provide them an opportunity to perform real-world activities and to interact with one another. The case study stipulated the common problems/challenges encountered by the students such as time constraint in doing the different activities, readiness of the students to learn through the integration of the said approaches, the availability of reference materials, and the preparation of materials as well as the conduct of experiments which might require much time and effort. The students also articulated that the use of Interdisciplinary Contextualization and Inquiry-Based Approach in teaching and learning Science should be fully implemented by more teachers. Based on the strength of the findings, the test of statistically significant difference before and after the use of the interdisciplinary contextualization and inquiry-based approach revealed a no significant difference during the first trial run but with a highly significant difference during the second trial run. This finding signifies that students' level of engagement in learning Science has significantly increased through the long-term utilization and assimilation of Interdisciplinary Contextualization and Inquiry-Based Approach. Thus, teachers ought to continuously incorporate these constructive approaches in teaching and learning science.

REFERENCES

[1] A Quick Guide To Research (2016). Misamis University Graduate School, Ozamis City. 2016 Edition.

[2] Apedoe, X. S., Walker, S. E., & Reeves, T. C. (2006). Integrating inquiry-based learning into undergraduate geology. Journal of Geoscience Education, 54(3), 414-421. Retrieved from https://search.proquest.com/docview/202781863?accountid=149218

[3] Cavallo, A. M. L., Potter, W. H., and Rozman, M. (2004). Gender differences in learning constructs, shifts in learning constructs, and their relationship to course achievement in a structured inquiry, yearlong college physics course for life sciences majors, School Science and Mathematics, v. 104, p. 288-300.

[4] Chernus, K. and Fowler, D. (2010). Integrating Curriculum: Lessons for adult education from career and technical education.

[5] Concept to Classroom: Inquiry-Based Learning. What it is, how it differs from traditional, benefits, ideas for use in education. http://www.thirteen.org/edonline/ concept2class/inquiry/index.html.

[6] Dotterer, A. M., & Lowe, K. (2011). Classroom context, school engagement, and academic achievement in early adolescence. Journal of Youth and Adolescence, 40(12), 1649-60. doi:http://dx.doi.org/10.1007/s10964-011-9647-5

[7] Dupuis, V.L., Gollnick, D.M., Hall, G.E., Johnson, J.A., Musial, D. (2008). Foundations of American Education: Perspectives on Education in a Changing World. (14th ed., pp.327-329). Boston: Pearson Education, Inc.

[8] Eisenkraft, A. (2003). Expanding the 5E model. Science Teacher, 70(6), 56-59.

[9] Goode, D. (2000). Creating a context for developmental English. Teaching English in the Two-Year College, 27, 270-277.

[10] K to 12 Science Curriculum Guide (2013). Republic of the Philippines, Department of Education, DepEd Complex, Meralco Avenue, Pasig City. December 2013.

[11] K to 12 Toolkit (2012). Reference Guide for Teacher Educators, School Administrators, and Teachers. Southeast Asian Ministers of Education Organization (SEAMEO), Regional Center for Educational Innovation and Technology, Commonwealth Avenue, Diliman, Quezon City 1101 Philippines. www.seameo-innotech.org.

[12] Karsten, H. D., & O'Connor, R.E. (2002). Lessons learned from teaching an interdisciplinary undergraduate course on sustainable agriculture science and policy. Journal of Natural Resources and Life Sciences Education, 31, 111. Retrieved from https://search.proquest.com/docview/194504826?accountid=149218

[13] National Research Council. (2000). Educating teachers of science, mathematics, and technology: New practices for the new millennium. Washington, DC: The National Academies Press.

[14] Perin, D. (2011). Facilitating student learning through contextualization: A review of evidence. Community College Review, 39(3), 268-295. Retrieved from https://search.proquest.com/docview/892714807?accountid=149218

[15] Shell, D. F., Brooks, D. W., Trainin, G., Wilson, K. M., Kauffman, D. F., & Herr, L. M. (2010). The unified learning model: How motivational, cognitive, and neurobiological sciences inform best teaching practices. London: Springer.

[16] Simpson, M. L. & Nist, S. L. (2002). Encouraging active reading at the college level. In C. C. Block & M. Pressley (Eds.) Comprehension instruction: Research-based practices (pp 356-381). New York, NY: Guilford.1989.

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