Web-Based Science Learning as Innovative Instruction

Bruce Marvin Ruaro, Urdaneta City National High School, The Philippines

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Abstract
There are so many mediums of technology, which is radically redefined to obtain communication and change the view of teaching and learning. The widespread use of the World Wide Web (www) extended the capacity of the different educational institutions involved in training to extend the possibilities of e-learning. There are a lot of challenging points in the dynamic and challenging field of e-learning. The use of the internet to bridge the digital divide is one of the challenges which are experienced by different educational institutions in the country. This study aimed to determine the possibility of web-based learning in teaching science subjects specifically in the Senior High School. Innovative instruction applied three (3) different teaching approaches namely: Inquiry-based, Problem-based, and Project-based. Benefits of this approaches have been cited by numerous proponents which include greater depth of understanding of concepts, broader knowledge base, improved communication and interpersonal/social skills, enhanced leadership skills, increased creativity, and improved writing skills. Most of the extent of utilization of web-based learning on this study along the different approaches in teaching science is highly effective. All remaining variables are noted to be effective. Improvement of the posttest result was noted using the web-based instruction. The scores of the students in all approaches are normally distributed. A significant difference in the pretest and posttest results along the different approaches was noted. Also, it was found out that there is a significant relationship between the post-test result and the different approaches that rejected the null hypothesis.

Keywords: Web-based Learning, Innovative Instruction, Science Learning, Earth Science

Introduction

Since 1990's web-based education has become an extremely significant branch of educational technology. Pulsen (2003) adopted the concepts of Keegan (1995) that a web-based education is characterized by the separation of teachers and learners, the influence of an educational organization, the web technologies presenting educational content, and the provision of the two-way communication via the internet. Online learning can be considered as one of the struggling terms to define which was cited by Oblinger (2005). Meanwhile, Lowenthal et al. (2009) defines it as a reference technological medium or context with which it is used.

According to Campbell (2007), maturating educational technology had identified important issues like the academic technology profession moves to an "Instruction 2.0". Enumerated issues are: (1) establishing and supporting a culture of evidence; (2) demonstrating improvement of learning; (3) translating learning research into practice; (4) selecting appropriate models and strategies for e-learning; (5) providing tools to meet growing student expectations; (6) providing professional development and support to new audiences; (7) sharing content, applications, and application development; (8) protecting institutional data; (9) addressing emerging ethical challenges; and (10) understanding the evolving role of academic technologists. This key technology-related teaching and learning issues must be addressed to maintain the continuity of development in transforming the academic technology.

In the educational policy research series of the UNESCO, which was conducted by Bangkok Office of Asia and Pacific Regional Bureau for Education, it was indicated on the mapping of the content areas taught at the lower secondary level that 9 out of 15 countries excluding the Philippines include technology as one of the prescribed subjects in their curriculum.

In the Philippines, online learning and delivery of instructional content are associated with support services. The use of the internet to bridge the digital divide is one of the challenges which is experienced by different educational institutions in the country. Furthermore, it is the mechanism which is being used in ensuring the quality education in e-learning in an extensively detailed manner.

This research determined the use of web-based learning in the field of teaching science subjects specifically Earth Science Unit I for Grade 11 learners in the senior high school. Respondents are the four (4) science teachers and the one hundred twenty (120) Grade 11 students enrolled in Academic Track in Urdaneta City National High School, Urdaneta City, Pangasinan, Philippines.

A thirty (30) items pretest and posttest will be administered. This study is delimited to Earth Science and does not include Physical Science, Physics, Chemistry, and other components of science subject.

This study aims to answer the extent of utilization of web-based learning in teaching science subjects specifically earth science which one of the core subjects in the senior high school curriculum along the different approaches namely; inquiry-based, problem-based, and project-based.

The sub-questions of this study include (1) level of academic performance of the learners taught using the web-based instruction in the areas of inquiry-based, problem-based, and project-based, regarding the pretest and posttest scores mean, median, skewness, kurtosis, and standard deviation. The researcher also looked at the (2) the significant difference in the academic performance of the learners in the pretest and posttest along the different instructional approaches, and (3) the significant relationship between the post-test result and the instructional approaches used by the teachers namely: Inquiry-based; Problem-based; and Project-based.

The study's research design consisted of the distribution of checklists to the four (4) senior high school teachers at Urdaneta City National High School, while the pretest and posttest were administered to the one hundred eleven (111) senior high school students who are currently taking earth science.

Table 1
Profile of the Teacher-Respondents
N=4

Profile Variables		Frequency	Percentage
Sex			
	Male	2	50
	Female	2	50
Age			
	21-30 y.o.	1	25
	31-40 y.o.	0	0
	41-50 y.o.	3	75
	51.60 y.o.	0	0
	61 and Above	0	0
Civil Status			
	Single	1	25
	Married	3	75
	Widow	0	0
	Separated	0	0
Status of Appointment			
	Permanent	3	75
	Provisionary	1	25
Academic Rank			
	Teacher I	0	0
	Teacher II	2	50
	Teacher III	2	50
	Master Teacher I	0	0
	Master Teacher II	0	0
Highest Educational Attainment			
	BSE/BSEED	0	0
	With MA Units	4	100
	MA Degree Holder	0	0
	With Ph.D./Ed.D. Units	0	0
	Ph.D./Ed.D. Holder	0	0
No. of Years Teaching Science Subject			
	Science 7	0	0
	Science 8	0	0
	Science 9	0	0
	Science 10	0	0
No. of Relevant Trainings and Seminars Attended			
	International Level	0	0
	National Level	0	0
	Regional Level	4	100
	Provincial Level	0	0
	Division Level	4	100
	School Level	4	100

It could be seen in Table number 1 that there are equal numbers of male and female teachers who are teaching earth science in the Urdaneta City National High School (Senior High School). The bracket of 41-50 years old teacher has the highest percentage (75%) compared to the (25%) on the age bracket of 21-30 years old. Three (3) out four (4) respondent teachers are married. Meanwhile, the same percentage is observable for teachers who have a permanent appointment (75%) and provisionary (25%). The teacher-respondents are equipped with seminars and training from regional (100%), school division (100%), and school (100%). As cited by Galloway (1998), the instructor guides students to the relevant information rather than obliging the students to search for information. With this, it is necessary for the teachers to

have additional knowledge and skills in instructing the learners by any means. Also, Alfonso (2016), stated that today's generation identifies problems in translating research and studies that enables learning as to learner-centered, flexible, distributed, collaborative, integrative, innovative, and creative. These characteristics were promoted and included on the different seminars and training attended by the teachers for the senior high school before and during teaching the respective subjects.

Table 2
Profile of the Student-Respondents'
N=111

Profile Variables	Frequency	Percentage
Age		
16 and Below	0	0
17-18	102	91.89
19-20	9	8.11
21 and Above	o	0
Sex		
Male	44	39.64
Female	67	60.36
General Average		
80 and Below	14	12.61
81-85	56	50.45
86-90	29	26.13
91 and Above	12	10.81
No. of Siblings		
0	6	5.41
1	36	32.44
2	59	53.15
3	5	4.50
4 and Above	5	4.50
Parents' Occupation		
Teacher	18	16.22
Engineer	3	2.70
Helper	57	51.35
Vendor	25	22.52
Driver	8	7.21
Parents' Highest Educational Attainment		
Elementary Level	0	0
High School Level	41	36.94
Technical-Vocational	0	0
Bachelors Degree Holder	58	52.25
With MA Units	12	10.81
Masters Degree Holder	0	0
With Ed.D./Ph.D. Units	0	0
Doctors Degree Holder	0	0
Family Monthly Income		
5,000- below	12	10.81
5,001-10,000	31	27.93
10,001-15,000	28	25.23
15,000-20,000	19	17.12
20,001-Above	21	18.92

As shown in Table number 2, most of the student-respondents are in the age bracket of 17-18 years old (91.89%) and 19-20 years old (8.11%). Females (60.36%) are more than males (39.64%). Most of the learners from the group have an average rating ranging from 81-85% (50.45%) and 86-90% (26.13%). As cited by Alfonso (2016), to be able to work in different contexts, learners are produced to have the ability to seek new information from different sources, translate information into applicable knowledge, and communicate the knowledge in various forms and situations that address the challenges of the education in the 21st century.

There are 53.15% among the student-respondents with two (2) siblings, 32.44% with one (1) sibling, while the others three (3) siblings (4.50%) and 4 and above (4.50%).

Their parents are helpers (51.35%), vendor (22.52%), teacher (16.22%), driver (7.21%), and engineer (2.70%). It could also be seen on the table that 52.25% of their parents are bachelors degree holder, 36.94% are high school graduate and remaining 10.81% are with masters degree units. The bracket of P5,001-10,000 in the family monthly income has the highest percentage of 27.93%, followed by P10,001-15,000 (25.23%), P20,001 and above (18.91%), P15,001-20,000 (17.12%), and P5,000 and below (10.81%).

Table 3
Extent of Perception on the Use of Web-Based Learning in Teaching Science Subject along Inquiry-Based Approach

	WM	TE
Using the web-based learning as instructional innovation, I…		
1. determine the ability level of students' performance and capabilities, prior to learning and past experienced learning, etc.	4.00	Highly Effective
2. survey students' interest by asking students open-ended questions with learning preference.	4.25	Highly Effective
3. plan activities that suits the learner.	5.00	Highly Effective
4. give direct instruction to the learner.	5.00	Highly Effective
5. process information gathered from the learner.	4.00	Effective
6. identify instructional activities of the learner.	4.25	Highly Effective
7. interact as variety of media to explore and wonder.	4.00	Effective
8. respond to text by jotting or drawing questions, connections, and reactions	3.75	Effective
9. engage in deeper reading and researching (e.g. books, articles, websites, videos, etc.)	3.75	Effective
10. reflect upon and articulate the learning and cooperative process	4.25	Highly Effective
OVERALL	**4.23**	**Highly Effective**

Mean Range	Literal Value	Descriptive Equivalent	Transmuted Equivalent
4.20-5.00	A	Always	Highly effective
3.40-4.19	B	Often	Effective
2.60-3.39	C	Sometimes	Moderately Effective
1.80-2.59	D	Seldom	Slightly Effective
1.00-1.79	E	Never	Not Effective

Table 3 presents the extent of perception on the use of web-based learning in teaching science along the inquiry-based approach. Based on the given statements, 7 out of 10 resulted to be "Highly Effective," while the remaining falls under the transmuted equivalent of "Effective." As cited by Newman et al. (2004), this kind of approach in teaching relied on the teachers' recognition about the importance of presenting problems to learners that will change their current conceptual understanding for they are forced to reconcile anomalous thinking and new understanding.

Table 4
Extent of Perception on the Use of Web-Based Learning in Teaching Science Subject along Problem-Based Approach

	WM	TE
Using the web-based learning as instructional innovation, I…		
1. simulate useful knowledge that can add learning to the learning with fellow learner	4.50	Highly Effective
2. give more exercises with simulators to the learners	4.50	Highly Effective
3. improve the familiarization of the learners with the concept of the topics.	5.00	Highly Effective
4. instruct by means of useful learning strategy	4.75	Highly Effective
5. let the students themselves resolve the problems that are given to them.	4.00	Effective
6. give more significance to the meaning, applicability and relevance to the learning materials for better understanding of the subjects.	4.75	Highly Effective
7. encourage self-directed learning by confronting students with problems and stimulates the development of deep learning.	4.25	Highly Effective
8. provide semi-realistic experience	4.75	Highly Effective
9. develop the students key skills relevant to the performance standard.	4.25	Highly Effective
10. develop decision making	4.50	Highly Effective
OVERALL	**4.53**	**Highly Effective**

Mean Range	Literal Value	Descriptive Equivalent	Transmuted Equivalent
4.20-5.00	A	Always	Highly effective
3.40-4.19	B	Often	Effective
2.60-3.39	C	Sometimes	Moderately Effective
1.80-2.59	D	Seldom	Slightly Effective
1.00-1.79	E	Never	Not Effective

Table 4 presents the extent of perception on the use of web-based learning in teaching science along the problem-based approach. Based on the given statements, 9 out of 10 resulted in being "Highly Effective," and the remaining statement falls under "Effective." As cited in the study conducted by Hmelo-Silver (2004) that suggest the learners' experiences of solving problems can be learned through content and thinking strategies which can develop decision making and key skills relevant to the performance standard. In addition, the exploratory study conducted by Sengel (2005) states that problem-based learning provides qualitative and quantitative outputs on the integration of a specific online information system into the science curriculum by using authentic task in a class setting similar to simulation of useful knowledge that can add learning to the learning with fellow learner that resulted to 4.50. As cited by Marmara et al. (2007), it was then determined that the passively affected by the implementation of problem-based active learning model is the students' academic achievement and their attitudes towards the science course. It was found out that the application of problem-based active learning model affects students' conceptual development positively and keeps their misconceptions at the lowest level.

Table 5
Extent of Perception on the Use of Web-Based Learning in Teaching Science Subject along Project-Based Approach

	WM	TD
Using the web-based learning as instructional innovation, I…		
1. import knowledge and skills to the learners derived from standards and key concepts of the subject.	4.50	Highly Effective
2. develop learners critical thinking/ problem solving, collaboration, and communication skills.	4.50	Highly Effective
3. encourage learners to good questions regarding the processes.	4.25	Highly Effective
4. organize task around a driving project.	4.00	Effective
5. establish a need to know understand concepts that lead the learners to identified questions beginning with an entry event that generates interest and curiosity up to the last.	4.50	Highly Effective
6. allow the learners to make some choices about the products to be created, how they work, and how they use their time.	5.00	Highly Effective
7. Incorporate revision and reflection to the learners for feedback.	4.25	Highly Effective
8. include a public audience, students present their work to other people, beyond their classmates and teacher.	4.00	Effective
9. deem peer assessment that can encourage the students to be more engage with material.	4.25	Highly Effective
10. benefit of deeply studying marking criteria which will be identified by the students.	4.25	Highly Effective
OVERALL	**4.35**	**Highly Effective**

Mean Range	Literal Value	Descriptive Equivalent	Transmuted Equivalent
4.20-5.00	A	Always	Highly effective
3.40-4.19	B	Often	Effective
2.60-3.39	C	Sometimes	Moderately Effective
1.80-2.59	D	Seldom	Slightly Effective
1.00-1.79	E	Never	Not Effective

Table 5 presents the extent of perception on the use of web-based learning in teaching science along the project-based approach. Based on the given statements, 8 out of 10 have a transmuted equivalent of "Highly Effective," while 2 out of 10, were "Effective." According to Markham (2011), this approach allows the learners learn knowledge and elements of the core curriculum, it doesn't only integrates knowing and doing, but also apply what they have learned in solving authentic problems and produces results that matter. Learners take advantage of digital tools to produces high-quality collaborative products which reward intangible assets such as drive, passion, creativity, empathy, and resiliency.

Table 6
Summary of Extent of Utilization on the Use of Web-Based Learning in Teaching Science Subject

Instructional Approaches	OWM	DE
Inquiry-Based	4.23	Highly Effective
Problem-Based	4.52	Highly Effective
Project-Based	4.35	Highly Effective
OWM	4.36	Highly Effective

Table 6 shows the overall weighted mean of the three (3) instructional approaches which are: Inquiry-based (4.23), of Problem-based (4.52), and Project-based (4.35) with the descriptive equivalent of "highly effective."

Table 7
Level of Academic Performance of the Learners Using the Web-Based Instruction

Variables	Mean	Median	Standard Deviation	Skewness	Kurtosis
Inquiry-Based					
Pretest	4.87	5	0.82	0.24	-1.48
Posttest	9.00	9	0.86	0.00	-1.67
Problem-Based					
Pretest	4.40	4	1.06	0.14	-1.18
Posttest	9.03	9	0.73	-0.04	-1.11
Project-Based					
Pretest	4.40	4	1.10	0.08	-1.31
Posttest	6.95	7	0.80	0.08	-1.44
Overall					
Pretest	13.67	14	1.74	0.17	-0.63
Posttest	23.44	24	3.26	-0.91	-0.44

Table 7 shows the mean, median, standard deviation, skewness and kurtosis of the pretest and posttest result of the learners in earth science before and after using the web-based instruction for the subject. It is shown that in the inquiry-based pretest have the mean of 4.87 and posttest with 9.00, problem-based pretest has 4.40 and posttest with 9.03, and project-based pretest with 4.40 and posttest with 6.95. It is also observable that the median scores along the different approach's pretest and posttest are near the mean of the scores from the pretest and posttest. The standard deviation of the inquiry-based posttest result 0.86 is higher than the pretest 0.82, while in the problem-based posttest 0.73 than the pretest of 1.06, and on the project-based post-test with 0.80 than the pre-test with 1.10. Blumenfeld & Krajcik (2006) cite studies by Marx et al., 2004, Rivet &Krajcki, 2004 and William & Linn, 2003 state that "research has demonstrated that students in project-based learning classrooms get higher scores than students in the traditional classroom."

In the skewness of the pretest and posttest results, the inquiry-based questions resulted to 0.24(pretest) and 0.00 (posttest) that indicates almost same result on the scores of the learners, while in the problem-based pretest with 0.14 and posttest with -0.04 skewness indicates improvement on the scores, and on the project-based pretest and

posttest with 0.08 that also indicates same scores. On the presented kurtosis, the value of the kurtosis of the pretest and posttest result is near zero (0) then the distribution of the scores is normal, which is visible on the table that the overall kurtosis of the pretest result is -0.63 and posttest of -0.44, therefore the scores of the students in all approaches are normally distributed. Olson (2002) mentioned that the use of web-based instruction recognizes the importance of evaluating its effect on students' outcome when the mode of instruction increases. Comparison of the results with the conventional classroom instruction resulted to "better."However, major differences were noted in technology and presentation rather than instructional content that can obscure the true relationship between the outcomes of the web-based instruction.

Table 8

Significant Difference in the Academic Performance of the Learners in the Pretest and Posttest along the Different Instructional Approaches

Variable	t-value	Sig (p-value)	Interpretation	Decision
Inquiry-Based	-36.482	0.00	Significant	Reject Ho
Problem-Based	-37.981	0.00	Significant	Reject Ho
Project-Based	-19.827	0.00	Significant	Reject Ho
Over-all	**-28.809**	**0.00**	**Significant**	**Reject Ho**

Tables 8 shows that there is a significant difference in the pretest and posttest results along the different approaches that rejected the null hypothesis. These results presented that there were improvements on the scores of the learners from the pretest to posttest examination. This is parallel to the statement of Punie and Cabrera(2006), an environment supported by Information Communication Technologies (ICT) maybe even possible to imagine when looking at the current widespread diffusion and use of ICT in modern societies, especially the so-called "digital generation." Also, Collins (2006), stated that"Technology provides us with powerful tools to try out different designs, so that instead of theories of education, we may begin to develop a science of education. But it couldn't be an analytic science like physics or psychology, etc.; rather it must be a design science more like aeronautics or artificial intelligence.

Table 9

Significant Relationship Between the Post Test Result and the Instructional Approaches Used by the Teachers

Variable	r	Sig. (p-value)	Interpretation	Decision
Inquiry-Based	-0.115	0.003	Significant	Reject Ho
Problem-Based	0.033	0.000	Significant	Reject Ho
Project-Based	0.082	0.004	Significant	Reject Ho
Overall	**0.126**	**0.000**	**Significant**	**Reject Ho**

Table 9 shows that there is a significant relationship between the post-test result and the different approaches that rejected the null hypothesis. This means that inquiry-based, problem-based and project-based approaches affect the posttest scores of the learners. Science and technology are now well recognized with multi-disciplinary pursuits essentials for the advancement of knowledge and applications. In connection, Seng (2009) mentioned that education is all about equipping people with the cognitive and socio-emotional skills that are highly adaptable in fast-changing environments.

The need for new science arts of learning is futuristic with problem-based learning. Understanding its perspective as well as the innovative design can take part in its innovated environment.

Summary

The main problem sought to determine the possibility of a web-based instruction possibility of web-based learning in the Science, Technology, Engineering, and Mathematics (STEM) Strand in the K to 12 programs of the Department of Education in teaching science subjects.

Specific problem #1 focused on the (1a) profile of the teacher-respondent namely: sex, age, civil status, status of appointment, academic rank, highest educational attainment, science subject taught, number of years teaching science subjects, and number of relevant training and seminar attended, (1b) profile of the student-respondent namely: age, sex, general percentage average in the previous grade level, number of siblings in the family, parents occupation, parents highest educational attainment, and monthly income of the family.

Specific problem #2 determined the extent of utilization of the web-based learning in teaching science subjects along the following instructional approaches: Inquiry-based, Problem-based, and Project-based.

Specific problem #3 determined the level of academic performance of the learners taught using the web-based instruction in the areas of inquiry-based, problem-based, and project-based regarding pretest and posttest scores mean, median, skewness, kurtosis, and standard deviation.
Specific problem #4 determined the significant difference in the academic performance of the learners in the pretest and posttest along the different instructional approaches.

Specific problem #5 determined the significant relationship between the post-test result and the instructional approaches used by the teachers namely: Inquiry-based, Problem-based, and Project-based.

Salient Findings

The following are the salient findings of the study:
Finding #1a. There are equal numbers of male and female teachers who are teaching earth science in the Urdaneta City National High School (Senior High School). The bracket of 41-50 years old teacher has the highest percentage (75%) compared to the (25%) on the age bracket of 21-30 years old. Three (3) out four (4) respondent teachers are married. Meanwhile, the same percentage is observable for teachers who have a permanent appointment (75%) and provisionary (25%). There were two (2) teachers with Teacher II position and two (2) with Teacher III position. All of the teacher-respondents have units in their respective master's degree, but without teaching, experiences and are equipped with seminars and training from regional (100%), school division (100%), and school (100%).

Finding #1b. Most of the student-respondents are in the age bracket of 17-18 years old (91.89%) and 19-20 years old (8.11%). Females (60.36%) are more than males (39.64%). Most of the learners from the group have an average rating ranging from 81-85% (50.45%) and 86-90% (26.13%). There are 53.15% among the student-respondents with two (2) siblings, 32.44% with one (1) sibling, while the others three (3) siblings (4.50%) and 4 and above (4.50%). Their parents are helpers (51.35%), vendor (22.52%), teacher (16.22%), driver (7.21%), and engineer (2.70%). There are 52.25% of parents with a bachelors degree, 36.94% who graduated in high school and remaining 10.81% are with masters degree units. The bracket of P5,001-10,000 in the family monthly income has the highest percentage of 27.93%, followed by P10,001-15,000 (25.23%), P20,001 and above (18.91%), P15,001-20,000 (17.12%), and P5,000 and below (10.81%).

Finding #2. Based on the given statements in the inquiry-based approach, 7 out of 10 resulted to be "Highly Effective," while the remaining falls under the transmuted equivalent of "Effective." On the other hand, the problem-based approach has 9 out of 10 which is transmuted to be "Highly Effective," and the remaining statement falls under "Effective." Lastly, the project-based approach has 8 out of 10 have a transmuted equivalent of "Highly Effective," while 2 out of 10, were "Effective."

Finding #3.the inquiry-based pretest have the mean of 4.87 and posttest with 9.00, problem-based pretest has 4.40 and posttest with 9.03, and project-based pretest with 4.40 and posttest with 6.95. The standard deviation of the inquiry-based posttest result 0.86 is greater than the pretest 0.82, while in the problem-based posttest 0.73 than the pretest of 1.06, and on the project-based post-test with 0.80 than the pre-test with 1.10. In the skewness of the pretest and posttest results, the inquiry-based questions resulted to 0.24(pretest) and 0.00 (posttest) that indicates almost same result on the scores of the learners, while in the problem-based pretest with 0.14 and posttest with -0.04 skewness indicates improvement on the scores, and on the project-based pretest and posttest with 0.08 that also indicates same scores. On the presented kurtosis, the value of the kurtosis of the pretest and posttest result is near zero (0) then the distribution of the scores is normal, which is visible on the table that the overall kurtosis of the pretest result is -0.63 and posttest of -0.44, therefore the scores of the students in all approaches are normally distributed.

Finding #4. There is a significant difference in the pretest and posttest results along the different approaches with the following t-value: Inquiry-based (-36.482), Project-based (-37.981), and Project-based (-19.827) that rejected the null hypothesis. These results presented that there were improvements on the scores of the learners from the pretest to posttest examination.

Finding #5. There is a significant relationship between the post-test result and the different approaches that rejected the null hypothesis. The following p-value was noted: Inquiry-based (0.003), Problem-based (0.000), and Project-based (0.004).

Conclusions

The following are the conclusions drawn from the salient findings:

1. The teacher-respondents are qualified to teach because of their current enrolment to their respective master's degree and engagement to different seminars and training in the regional, division, and school level. The student-respondents are equipped with enough knowledge which is observable on the percentage of their general average. Also, most of the parents of the student-respondents are with bachelor's degree that could be a basis that they were assisted at home.

2. Most of the extent of utilization of web-based learning along the different approaches in teaching science is highly effective. All remaining variables are noted to be effective.

3. Improvement of the posttest result was noted using the web-based instruction. The scores of the students in all approaches are normally distributed.

4. There is a significant difference in the pretest and posttest results along the different approaches that rejected the null hypothesis. These results presented that there were improvements on the scores of the learners from the pretest to posttest examination.

5. There is a significant relationship between the post-test result and the different approaches that rejected the null hypothesis. Inquiry-based, problem-based and project-based approaches affect the posttest scores of the learners.

Recommendations

Based on the findings and conclusions presented, the following recommendations are suggested.

1. Continuous seminars and training for the senior high school teachers should be maintained to equip them with knowledge in the field of teaching.
2. The researcher recommends that the used of web-based learning materials should be used with the different approaches namely: Inquiry-based, Problem-based, and Project-based in teaching earth science.

3. While the researcher found out the improvement of the learners score on the posttest result of examination for earth science, it is still recommended to develop different instructional materials that can aid in the development of knowledge and skills of the senior high school's students to prepare them to the higher educational institution standards

4. It is also recommended that the future researchers of this study will try to develop another innovated instructional tool with another teaching approach that will increase the competencies of the learners to the digital world.

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Contact email: bmmr.071791@gmail.com / +63997-604-41-39