Learning Pedagogies in Teaching Integrated Science: Input for a Faculty Development Plan
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Abstract: This study aimed to determine the effectiveness of learning pedagogies in teaching science. The quantitative design was used. A validated questionnaire was distributed to the 24 grade 9 science teachers in the Division of Paranaque and a final grade in science for the past 3 grade levels were taken from the 1,402 out of 4,965 grade 10 students who were both selected through a purposive sampling technique. Majority of the respondents were young, in the teaching profession for 6-10 years now, and have attended 1-5 seminars/trainings. Findings of the study disclosed that the respondents sometimes used the learning pedagogies (M=3.25) with Inquiry-based Learning as the dominant pedagogy used (M=3.59) and Technology-based Learning, least used (M=2.85). Pearson r showed that these learning pedagogies were moderately effective on students' academic performance (M=81.33) with Technology-based learning as the most effective. Likewise, there was a weak negative relationship between academic performance and pedagogy. Based on the findings of the study, a faculty development plan was proposed.

Keywords: academic performance; pedagogy; science; students; teachers

1 INTRODUCTION
The K to 12 Curriculum in the Philippines is a major reform in education which started in 2012 via Republic Act 10157 and Republic Act 10533. It is implemented because of the poor quality of basic education, congested curriculum, and no mastery of concepts (Anacion, 2015). Also, completion of six years elementary and four years secondary do not prepare the students for a job in terms of emotional maturity because of their young age. Comparing the educational system of the Philippines to other countries, the Philippines has ten years basic education while most of the countries around the globe have 12 years basic education. The ten years of basic education becomes disadvantage for Filipinos who plan to work abroad (Cabansag, 2014).

Before the implementation of Spiral Progression Approach (SPA), result of standardized tests is low. Canacan (2017) cited that a report from the American Management Association states that the United States including Philippines have low scores in science and mathematics in Third International Mathematics and Science Study (TIMSS) as compared to other countries like Singapore, Taiwan, Hungary, and Japan who got the highest scoring. Likewise, during the first year of implementation of SPA, the mean score of the National Achievement Test (NAT) in science during the SY 2011-2012 in Paranaque City was 50.22, gradually increased to 57.8 and 60.47 on the second and third year respectively but decreased to 51.12 on the fourth year (Division of Paranaque Data).

The above findings revealed a gap between the learning pedagogies used in teaching science and standardized tests. For this reason, this study was conceptualized with the following objectives:
1. What is the dominant learning pedagogy used by the respondents in terms of collaborative learning, inquiry-based learning, integrative learning, reflective learning, and technology-based learning?
2. How effective are the learning pedagogies based on the students' academic performance?
3. Is there a correlation between learning pedagogies and students' academic performance?
4. Based on the result of the study, what input to the faculty development plan may be proposed?

2 METHODS
The respondents voluntarily participated in the study without accepting anything in return. Their privacy and anonymity were given importance. The schools where they were teaching during the conduct of the study were given code names as A, B, C, D, E, F, G, and H.

All the 24 grade 9 science teachers of eight (8) randomly selected schools were given validated questionnaires. First, a letter of indorsement to administer questionnaire was obtained from the Schools' Division Superintendent. The indorsement letter together with the survey questionnaires were then given to the school heads. The school heads indorsed the survey questionnaires to the science coordinator/science department head, who distributed the survey questionnaires to their grade 9 science teachers. The survey questionnaires were retrieved after 1 to 4 months from the science coordinators/department heads. The learning pedagogies used by the science teachers were tallied, analysed and interpreted using frequency and percentage. Mean was used to analyse the effectiveness of learning pedagogies. Pearson r was
used to identify the correlation between the learning pedagogies and students' academic performance. Likewise, other data like grades of the 1,402 grade 10 students who were purposively selected from a population of 4,965 were taken from their Form 137 at the records unit and population of teachers and students were taken from the Guidance Office.

3 RESULTS AND DISCUSSION

Dominant Learning Pedagogies

The dominant Collaborative Learning pedagogy was game-based (M=3.76) which was often used because it is fun, interesting, and exciting. On the other hand, the least CL pedagogy was round robin (M=1.98) which was rarely used because it is boring on the part of students who wait for their turn to talk.

Likewise, the dominant Inquiry-based Learning pedagogy was experimentation (M=3.76) which was often used because it is already integrated in the learner's resource material or book. The least IBL pedagogy was project-based (M=3.24) which was sometimes used because not all students are actively engaged in project-based instruction.

Moreover, the dominant Integrative Learning pedagogy was Content-based Instruction (M=4.31) which was often used because science as a subject is content-based, and standardized tests are content-based. On the other hand, the least IL pedagogy was role playing (M=3.01) which was sometimes used because few topics can be role played and it consumes a lot of time in planning before it can be presented to class.

Likewise, the dominant Reflective Learning pedagogy was Portfolio-making (M=4.33) which was often used in order for the students to learn the value of keeping documents, achievements, and other valuable things as evidences for their learning. On the other hand, Journal-making was the least RL pedagogy (M=2.53) which was sometimes used because it is time consuming.

Furthermore, the dominant Technology-based Learning pedagogy was video clips (M=3.67) because it can be reused again and again, as a reinforcement of the lesson, and it develops technological literacy. On the other hand, blogging was the least used TBL pedagogy (M=1.85) because not all students have access to internet and computer at home. This finding was supported by Manaligod (2012) and Kim (2013) that the most important issue that hinders the use of
ICT in public schools is lack of sufficient computers and facilities, student access, cost, class disruption, lack of teachers' technical and pedagogical skills, and lack of guidelines.

Among the five learning pedagogies, Inquiry-based Learning was the dominant learning pedagogy (M=3.59) because science as a subject involves experiment and was already embedded in the curriculum. David (2017) proved in his study that IBL improves academic performance. On the other hand, Technology-based Learning was the least used pedagogy (M=2.85) because of lack of computers, slow internet, and lack of technological skills among the teachers.

Effectiveness of Learning Pedagogies

Table 1: Effectiveness of Learning Pedagogies

<table>
<thead>
<tr>
<th>Learning Pedagogies</th>
<th>Overall Mean</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Learning (CL)</td>
<td>80.75</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td>Inquiry-based Learning (IBL)</td>
<td>80.88</td>
<td>Moderately Effective</td>
</tr>
<tr>
<td>Integrative Learning (IL)</td>
<td>79.75</td>
<td>Less Effective</td>
</tr>
<tr>
<td>Reflective Learning (RL)</td>
<td>79.75</td>
<td>Less Effective</td>
</tr>
<tr>
<td>Technology-based Learning (TBL)</td>
<td>80.65</td>
<td>Effective</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>81.33</td>
<td>Moderately Effective</td>
</tr>
</tbody>
</table>

Table 1 shows that the learning pedagogies were moderately effective on students' academic performance with a mean of 81.33. IBL which was the dominant pedagogy, as well as CL are likewise moderately effective. Daligdig (2014) cited that with the many pedagogies used in teaching, teachers must use the appropriate pedagogy that suits the varied learning styles of the students because choosing the right pedagogy is important in order to have an interactive and meaningful learning. On the other hand, TBL which was the least used pedagogy was proven effective on students' academic performance while RL and IL are less effective on students' academic performance.

Correlation between Learning Pedagogies and Academic Performance

Table 2: Correlation between Learning Pedagogies and Academic Performance

<table>
<thead>
<tr>
<th></th>
<th>Collaborative</th>
<th>Inquiry</th>
<th>Integrative</th>
<th>Reflective</th>
<th>Technology</th>
<th>Academic Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inquiry</td>
<td>0.456</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Integrative</td>
<td>0.286</td>
<td>0.097</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Reflective</td>
<td>0.292</td>
<td>0.120</td>
<td>0.120</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Technology</td>
<td>0.075</td>
<td>0.286</td>
<td>0.210</td>
<td>0.286</td>
<td>1.00</td>
<td>-</td>
</tr>
<tr>
<td>Academic Performance</td>
<td>0.024</td>
<td>-0.003</td>
<td>-0.023</td>
<td>-0.023</td>
<td>-0.023</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Data on table 2 unveil that the learning pedagogies have weak negative relationships. However, Technology and Reflective Learning shows a perfect correlation (r=1.00) but there is an inverse relationship between the variables (r = -0.345, -0.135, -0.128, -0.128) for Collaborative, Integrative, Reflective, and Technology respectively. Likewise only Academic Performance and Inquiry show a positive but weak correlation.

Moreover, findings reveal that there is a moderate to strong correlations among the learning pedagogies. Moderate relationship exists between Collaborative and Inquiry-based Learning (r = 0.494) and between Collaborative and Integrative (r = 0.368). Strong relationship exists between Collaborative and Reflective (r = 0.697), Collaborative and Technology (r = 0.697), Integrative and Inquiry (r = 0.697), Reflective and Inquiry (r = 0.696), and Technology and Inquiry (r = 0.696).

Furthermore, perfect correlation exists between Reflective and Integrative (r = 0.941) and Technology and Integrative (r = 0.941), and between Reflective and Technology (r = 1.00).

Table 3 shows the three-year proposed faculty development plan based on the result of the study. It aims to enhance the dominant learning pedagogies and strengthen the least usage pedagogies used by the science teachers.

4 CONCLUSION

The often used of IBL as a pedagogy proved that science is a subject that is focused on inquiry. Science involves experimentation and is already embedded in the curriculum. On the other hand, the sometimes used of Technology-based Learning as the least pedagogy but most effective on students' academic performance indicate a gap between technological advancement and practice. School administrators should allow their faculty to have a free access of school wi-fi and give their teachers intensive training on the use of technology as a pedagogy.

The moderate effect of pedagogy on academic performance is affected by teachers' choice of pedagogy. The moderate to strong correlation between the pedagogical methods imply that they are more effective when combined with other methods. Hence, school administrators should encourage their teachers to use pedagogical method with TBL by combining any learning pedagogical strategy of their choice with ICT in order to actively engage the millennial students in learning.
The weak correlation between pedagogy and students' academic performance indicates a gap. School administrators should consider evaluating the proposed faculty development plan for possible implementation.

REFERENCES


[6] Division of Paranaque Data
