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Differentiated Instructional Strategies of Junior High School Science Teacher in the Division of Batangas

Dr. Norrie E. Gayeta

College of Teacher Education, Batangas State University, Batangas City, Philippines

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Abstract - *Teachers' strategies are perceived to uplift the attitude and motivation to learn among students. It is therefore the duty of teachers to provide a climate of learning among their students. This climate may be best achieved through the use of varied methods and strategies that can help in the full attainment of the teaching goals and objectives. This study determined differentiated instructional strategies utilized by Junior High School science teachers. The study used the descriptive method of research using a researcher-made questionnaire as the main instrument for gathering data. The respondents were 293 public junior high school science teachers in the Division of Batangas, SY 2017-2018. Frequency was the statistical tool applied in treating the data gathered. Result revealed that flexible grouping, adjusting questions and rubrics were the most preferred differentiated instructional strategies utilized by public junior high school science teachers. Result also revealed that jigsaws and layering were the least used differentiated strategies. The study recommends the conduct of experimental study to test the effectiveness of the three identified topmost preferred differentiated instructional strategies in teaching science lessons and try its effectiveness even in other disciplines.*

Key Words: **Differentiated instruction, differentiated strategies, Junior High School science teachers**

1. INTRODUCTION

The junior high school science curriculum follows the spiral progression approach. This approach lets the students repeat the study of a subject at different grade levels, each time at a higher level of difficulty. Using the spiral curriculum in the classroom seems to be such a great concept for student-centered learning. Its aim is to enable the learners to strengthen the retention of learning and development of skills since design is organized through repeated learning opportunities from simple to more complex ideas. Concepts and skills are presented with increasing levels of complexity from one level to another.

The spiral curriculum sprouts from various learning theories and principles. One is the readiness of the students to learn where instruction is concerned with the experiences and backgrounds that make the students willing to learn. Organizing the curriculum around situations and problems that challenge and arouse students' curiosity motivates them to learn and appreciate science as relevant and useful. Rather than relying solely on textbooks, varied hands-on, minds-on, hearts-on activities are used to develop students' interest and let them become active learners [1].

Goodwin [2] described that classrooms are full of diverse learners thus teachers should use diverse materials and teaching methods in class. By using this practice, teachers will be able to meet the individual needs of their students. It will also help the educators to plan strategically in order to reach the needs of the diverse learners in the classrooms today so that they can achieve their target standards.

Knowledge that not all students learn in the same way prompted the researcher to identify differentiated instruction strategies used in teaching science lessons. The researcher realized the need of differentiated instruction as an approach in teaching and to use this instruction as the vehicle to promote better learning in science. The researcher believes that using differentiated instructional strategies in the classroom is not only a way to meet students' learning needs, but it is also a way to motivate and engage students in learning. If the students are engaged in learning, they are more likely to be motivated to learn.

1.1 Science Teachers

In the vision of science education, effective teachers of science create an environment in which they and students work together as active learners. Since some of the topics in science are not that easy to be taught and to be learned, instructional methods are deemed vital element in ensuring the successful understanding of the concepts. Thus, understanding how the students learn and what they know are imperative. To teach science, teachers must have theoretical and practical knowledge and abilities to use varied teaching strategies about science learning and science teaching. Their actions are deeply influenced by

the way the lesson was delivered in class or how the subject was taught and learned.

Teachers are the executors of teaching. They play a significant role in instruction designs and teaching activities. They also must make good use of teaching strategies for they support instruction. Teaching strategies that will help students learn the desired course contents and be able to develop achievable goals in the future. Strategies range from being very explicit and teacher-directed to being less explicit and student-centered. Some strategies are teacher-directed such as lectures, recitations, questions and practice. Others are more interactive such as various group and discussion methods. Still other strategies are more student-directed which often emphasize inquiry and discovery [3]. Schwartz [4] figured out what few strategies could actually make a big difference for learners, and which ones are a waste of time. He looked for strategies that are broadly applicable and do not just aid memorization and the approaches that deepen understanding and help students transfer learning to new situations.

1.2 Differentiated Instructional Strategies

Effective teaching requires different strategies to reach the desired goals. The best strategy is one that is most effective in reaching the particular goal in a specific situation. When the teachers are aware of their students' learning styles and interests they can identify the most effective differentiated instruction. Azlinda [5] found out in her study that the learning styles of the students influenced their ability to acquire information and respond to the learning environment. As such, teachers can plan and manage the learning activities better if they can discover their students' preferred learning styles. This can assist the students to enhance and take advantage of their natural skills and inclinations.

Differentiating instruction may require the teacher to deliver lessons at varying levels of difficulty based on the ability of each student. Practically speaking, it means teaching differently, or changing how instruction and practice occur in schools to enhance instructional effectiveness and increase student achievement. It also means changing how teachers teach and how students practice using whole class and small group activities. It includes teaching and practice activities that are data-informed, student-focused, purposeful and productive [6].

In line with the differentiated instructional strategies, teachers should be aware of designing lessons based on students' learning styles, grouping students by shared interest, topic and ability and also allowing them to dive into their own individual learning styles. According to Tomlinson [7], each student has a preferred learning style, and successful differentiation includes delivering the material to each style: visual, auditory and kinesthetic, and through words. The process-related method under this practice addresses that not all students require the same amount of support from the teacher, and students can choose to work in pairs, small groups, or individually. Teachers can enhance student learning by offering support based on individual needs.

The use of single-paced lessons which are taught using a singular instructional approach disregards the different learning styles and interests of the learners. As a common observation, students perform well when teachers utilized varied instructional methods. In a research conducted by Koeze [8], it was evidently showed that differentiated instruction had a positive effect on students' performance. In a related study, Konstantinou-Katzi et al., [9] proved that differentiated instruction was effective in improving students' performance and in enhancing their motivation and engagement. There was a positive impact on student learning and attitudes when differentiated instruction was applied.

2. RESEARCH METHOD AND PROCEDURE

This study used descriptive research method. The subjects of the study were taken from the population of 1, 230 Science teachers Division of Batangas during the SY 2017-2018. Purposive sampling method was applied. The researcher chose the sample based on the criteria appropriate for the study. In this case, respondents were 293 public junior high school science teachers who specialize in their field and who have been in the profession for more than three years and who are employing differentiated instruction as strategy in teaching science subjects.

The main instrument used in the study was the researcher made – questionnaire which was evaluated, validated, administered, tallied and scored according to the accepted practices in research. Interview was done to further validate the information gathered.

To gather the needed data, the researcher sought permission to the Division Superintendent to distribute the questionnaire to the target respondents. After the approval, the researcher administered the questionnaire to the science teachers in different secondary schools on the agreed schedule of distribution.

3. RESULTS AND DISCUSSIONS

Differentiated instructional strategies utilized by science teachers are presented in Table 2. As reflected in the table, majority or 276 or 94.20 percent of science teachers utilized flexible grouping as their differentiated instructional strategy in teaching science. This only

means that most of the science teachers prefer to use it in teaching for they find this strategy effective. During the interview, it was shared that teachers used flexible grouping because this strategy provides opportunities for students' interaction that support and encourage learning in the different areas in science especially in biology. For them, learning biology works well when in groups especially in topics like plant cell and animal cell.

Table 2
Differentiated Instructional Strategies Utilized by Science Teachers

Differentiated Instructional Strategies	Frequency	Percentage
1. Flexible Grouping	276	94.20
2. Adjusting Questions	267	91.13
3. Rubrics	264	90.10
4. Graphic Organizer	249	84.98
5. Concept Mapping	248	84.64
6. Think-Pair-Share	244	83.28
7. Tiered Lesson	222	75.77
8. Anchor Activities/ Sponge Activities	213	72.70
9. Inquiry-based Learning	211	72.01
10. Learning Through Play/ Play-based Learning	209	71.33
11. Cubing	197	67.24
12. Reciprocal Teaching	197	67.24
13. Problem-based Learning	181	61.77
14. Think-Tac-Toe	176	60.07
15. Independent Study	161	54.95
16. Curriculum Compacting	152	51.88
17. Learning Centers/Learning Through Work Stations	152	51.88
18. Jigsaws	139	47.44
19. Layering/ Layered Curriculum	98	33.45

This strategy provides opportunities for students to be part of many different groups based on their readiness, interest, or learning style. This finding supports the study of Castle et al., [10] that flexible grouping meets particular learning needs, keeps students' attention focused on the instructional task, and increases student confidence.

Adjusting questions was also utilized by science teachers as cited by 267 or 91.13 percent of the teachers. This finding infers that questions are often used by science teachers for it stimulates the recall of prior knowledge, promote comprehension, and build critical-thinking skills to the students. Teachers ask questions to help students uncover what has been learned, to comprehensively explore the subject matter, and to generate discussion and peer-to-peer interaction. Teachers adjust questions to ensure the students get the concept. This strategy is useful in studying biodiversity and ecosystem where concepts are at times difficult and so questions have to be simplified till understood. From the interview conducted it was revealed that adjusting question as a teaching practice is a major gauge of teaching effectiveness. For the teachers, to make a meaningful engagement of students in the discussion, they should be given open-ended questions which are prepared ahead and should be given time to reflect and respond appropriately. Because of this, teachers can be assured of the important content and ensure purposeful and significant questions which would realize the objectives of the lesson.

It can also be gleaned in the table that or 90.10 percent of teachers utilized rubrics as their differentiated instructional strategy in teaching which was affirmed during the focus group discussion. Result implies that teachers prefer to use rubrics in assessing students' work done through differentiated instruction. Rubrics was said to be useful when students make diorama of electrical distribution in physics. They find it easy to assess student by listing the criteria and corresponding points as basis. This finding is in line with the concept of Brookhart [11] that rubrics can be used to judge students' performance. Rubrics help distinguish different levels of quality in students' work with reference to a coherent set of criteria which includes descriptions of levels of performance.

Graphic organizer was used by 249 or 84.98 percent of teachers and concept mapping by 248 or 84.64 percent. Both of these methods help students to gather, organize and share information during the process of learning. They help teachers and students not only to identify and visually represent their views and knowledge but also help students recognize and depict relationships among concepts. This implies that both of those differentiated instructional strategy also help the teachers to assess students' readiness, interest and learning profile. Graphic organizers are useful in topics like types of volcanoes in earth science. This finding affirms the concept of Novak [12] that those strategies are effective in helping teachers identify students' prior knowledge and understanding and help them organize teaching and learning in a way that is meaningful to them.

It can also be seen in the table that 244 or 83.28 percent of teachers utilized think-pair-share and 222 or 75.77percent utilized tiered lesson as their differentiated instructional strategy in science teaching. This result implies that these strategies were also preferably used by the science teachers for they believed that these can help students to formulate better answer during the teaching-learning process. Based from the focus group discussion, teachers cited the use of these strategies to ensure that all students explore ideas and use skills at a level that builds on their prior knowledge. In addition to that, asking student to think by themselves, pair with other students, and share their ideas naturally gives them time to think and access information. This strategy is most effective in teaching students' lessons on chemistry. This finding affirms concepts of William, D. et.al. [13] that greater retention and students' achievement will result when students are given more wait time for thinking. As the teacher comes to know the learners better and recognize their levels of readiness, questions can be differentiated by level of complexity. This may challenge learners at or just beyond their levels of comprehension or experience.

Anchor activities or sponge activities, inquiry-based learning, play-based learning, reciprocal teaching and cubing were differentiated instructional strategies were employed by almost 70 percent of the teachers in teaching science. Results suggest that teachers offer other tasks to students to sponge up the extra time without wasting instructional time. Based from the teachers' response on the focus group discussion, they asked the students what they want to know more about the lesson which can trigger their curiosity. The students also play games in relation with the lesson and they also discuss current issue or topic about their lesson. As Gregory and Chapman cited, tasks may be provided for students when extra time is available. These tasks are useful when the teacher is working with one group of students while other groups finish what they are doing. These help the students become more self-directed learners.

Problem-based learning, think-tac-toe, independent study, learning centers, curriculum compacting, jigsaws, and layering were the least used by almost 40-60 percent science teachers. Teachers cited during the focus group discussion that they were hesitant to use such strategies as they were not familiar on these and some of these strategies require longer period of time to accomplish. These findings are parallel to the findings of Schwartz that some of the best learning strategies are not often used by teachers or students largely because of time pressures in the classroom. There are some activities which really require more time to finish like some of the experiments in biology. Because of that, some teachers do not ask their students to perform those activities.

4. CONCLUSION

Flexible grouping, adjusting questions and rubrics are the most preferred differentiated instructional strategy utilized by science teachers, whereas, jigsaws and layering were the least used differentiated strategies.

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