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Research Article

Improving the Discussion on Weather Patterns and Seasons in the Philippines through Differentiated Instruction: A Quasi-Experiment

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Abstract

Academe has always been working on innovating diverse strategic instructions employed in the classroom to effectively transfer knowledge and achieve curriculum objectives. Academic intervention is vital in developing new and existing skills, thus motivating learners' competence in this contemporary milieu. In the literature, little to no attention is given to improving classroom discussion using differentiated instructions. This study aimed to evaluate the efficiency of differentiated instruction as a method of teaching weather patterns and seasons of the Philippines to students among grade 6 learners at Moalboal Central Elementary School, Moalboal, Cebu, Philippines. This study utilized a quasi-experimental research design participated by 30 respondents in total for both experimental and controlled groups. A T-test was used as a statistical tool to analyze the degree of difference. In the pretest, the results showed that both groups' mean (11) were equal. The posttest showed a difference of three points from the controlled group's mean (10) to the experimental group's mean (13). Based on the data gathered, the conventional method displayed no significant difference (p-value 0.42), whereas the utilization of differentiated instruction implied that there is a significant difference (p-value 0.00) as a result. Hence, the intervention suggested can make a difference in elevating the students' learning experience. It is recommended to have this strategy employed in different topics to verify its effectiveness in improving classroom discussion.

Keywords: Differentiated Instruction, Weather Patterns, Seasons in the Philippines, Quasi-experimental

Introduction

Meeting the needs of students that possess diverse learning styles is a strenuous process. It has been proven that in addressing and developing the students' distinct abilities, differentiated teaching and learning strategies are effective (Aljaser, 2019). Based on research, students want to be taught in a variety of modalities. They have different interests and learning styles (De Jesus, 2012). Use of differentiated instruction is not been prevalently used in the past decades. And as a result, it may have negative implications and consequences for students being disadvantaged, demotivated, and having learning issues (Ramli & Yusoff, 2020). Hence, in accordance with the recent research and systematic review of differentiated instruction techniques, when used effectively, differentiated education can raise student performance in elementary schools (Deunk et al., 2018).

Weather patterns and seasons in the Philippines is one of the significant and relevant topics specifically in Science. As a Grade 6 learner, one may not have an in-depth understanding of the subject matter. It is of great help for students to analyze that certain natural phenomena have a repeating pattern and that studying the seasons will help them understand the course of time and teaches them that change is inevitable. A few more learners prefer visuals, while others learn better by conversing in groups and with a colleague, while others still prefer learning by doing and being active and participative (De Jesus, 2012). The effectiveness of utilizing differentiated instruction to motivate learners to certain fundamental skills was discussed by Robinson et al. (2014), who discovered that on average, 83.4 percent of students' grades increased, while 12.5 percent stayed the same (Olicia, 2017). This means that this strategy provided a leap of increase in their academic performance.

Differentiated instruction is an educational technique that adapts learning to meet the needs of individual students which aims to enhance both student learning and motivation and tends to teach to the middle or primarily focuses on reaching average children while traditional instruction frequently fails to meet the needs of struggling and advanced learners (Good, 2006). Differentiated Instruction is applied in diverse classrooms where the learners are grouped with different tasks. Stronge & Tomlinson (2004) claimed

that in taking into account the student's various learning styles and interests improves their capacity to stay engaged and optimistic as well as their drive to study. Olicia (2017) cited Valiande et al. (2011), and also supported that the utilization of differentiated instruction in diverse learning classrooms can impact the academic performance of the learners. The study revealed that by effectively managing diversity and providing learning opportunities for all students, the implementation of distinctiveness had made a big step in dealing with the negative effects of socioeconomic factors on students' achievement. And that in mixed ability classes, the positive change in student accomplishment has indicated that differentiation can be an effective teaching strategy.

Teachers who have the expertise and resources to diversify their classes may be able to improve test results and help low-achieving children succeed, while bright and outstanding students' learning progress may be accelerated (Robinson et al., 2014). The teacher's major role is to help learners develop their understanding. By trying to make sense of their potential to learn differently. Whereas, the teacher's primary responsibility is to help students deepen their understanding; thus, this is where differentiated instruction comes in creating a basis for addressing learner variation as an important component of instructional planning with critical elements namely: who we educate, where we teach, and how we teach. (Robinson et al., 2014).

Differentiation allows envisioning a classroom set-up in which teachers and learners share responsibility for making things work for themselves and others. But, regardless of changes and continuous innovation in the system of education, differentiated instruction has not been widely implemented, and teachers' teaching methods have not changed significantly from before. Traditional teacher-centered teaching methods have been discovered to continually dominate instruction. Despite receiving professional development training on differentiated instruction, teachers rarely use this method of teaching in the classroom due to the difficulties in implementing the differentiated instruction framework and prefer to use traditional approaches instead (Afowala & Lawani, 2020).

This study probed the effectiveness of differentiated instruction in teaching Weather Patterns and Seasons in the Philippines to Grade 6 learners. Furthermore, this study accentuated the significance and the efficacy of the utilization of this strategy which may produce positive outcomes and progress in students' learning performance.

Research Questions

This study determined differentiated instruction as a strategy for discussing Weather Patterns and Seasons in the Philippines among Grade 6 learners. Further, this study elicited pertinent information in answering the following questions:

1. What is the pre-test result of the two groups of respondents?
    1.1. Controlled Group
    1.2. Experimental Group
2. What is the post-test result of the two groups of respondents?
    2.1. Controlled Group
    2.2. Experimental Group
3. Is there a significant difference between the pretest and post-test scores of the controlled group and experimental group?

Literature Review

This part includes several relevant sources and literary works that would support the validity of the claims made regarding the significance and relevancy of the study's construct. Included here are the studies and articles from different perspectives of the strategy being tested in this research. Further, the different works of literature mentioned in this section shed light on how the differentiated instruction as a strategy can be of great help in discussing a topic of a diverse classroom.

Aljaser (2019) claimed that the findings in his study indicated that differentiated education was more effective at piquing the interest of primary school underachievers than the traditional approach. The research showed concrete evidence that differentiated instruction was a viable strategy to augment their engrossment and proficiency in the specific subject matter. The use of differentiated instructional approaches has shown to be successful in addressing the various talents and potentials of students as well as in the development of their skills. The experimental group of students indicated a high level of self-actualization, proving that differentiated instruction enhanced their capacity for self-actualization. It is recommended to have a training session or workshop that can held to prepare teachers for creating and implementing differentiated teaching in light of these findings, according to the author.

In light of this, the idea of differentiated instruction has gained significant traction throughout educational

systems. Legislative changes over the past several years have caused classrooms to shift, resulting in a more varied population of children with a range of skill levels (Bulgren et al., 2013). While this move may be advantageous for kids, it may also be a challenge for educators to meet all learning demands (Prain et al., 2013). Learning about these difficulties could help instructors find methods to get beyond them and successfully use DI in the classroom (Tobin & Tippett, 2014).

There are various ways that learners acquire knowledge and assimilate it (Gregory & Chapman, 2012). In order to accommodate the learning preferences of the students, educators must use a wide range of instructional activities. Some pupils prefer particular techniques of learning. The best approach for students to learn is how teachers try to adjust their teaching methodologies. If learning is approached properly, students will do better not only in the learning environment but also in their career prospects and individual growth. Naturally, we must understand how to identify the children's preferences and choose the most appropriate technique if we are to know how to accommodate various learning styles in the classroom.

Learners who might have otherwise fallen farther behind in their studies can benefit from DI since it makes an effort to accommodate their needs (Vigdor, 2013). Students who have the opportunity to exhibit their learning potential that plays to their capabilities may be more motivated to learn and achieve greater success (Crim et al., 2013). Schools that support DI may be able to improve their test results on state exams (Wu, 2013).Knowing how children learn best can have a significant impact on how well they perform in the classroom. The implementation of differentiated instruction calls for planning time, administrative support, training, and a positive outlook (Acosta-Tello & Shepherd, 2014). DI is exceedingly difficult to implement if these conditions are not met.

As cited by Magayon & Tan (2020), Anderson (2007) claimed that Teachers in the modern classroom (K–12 curriculum program) are under pressure to keep up with perilous assessment while also having difficulty meeting the different needs of the individuals. He continued by saying that many people would argue that it was impossible to fulfill all of the students' needs while also expecting them to perform well on exams; however, Tomlinson & Santangelo (2012) argued that Differentiated Instruction is a way of responding to these hurdles and relevant concern that student outcomes are likely to be unsatisfactory unless the curriculum and instruction are effective and appropriate for academically-diverse learners. Additionally, Robinson et al. (2014) investigated the efficacy of utilizing DI to encourage children to read and discovered that, on average, 83.4 percent of the students' reading grades increased, 12.5 percent of the grades remained the same, and 41 percent of the grades fell.

Joseph et al. (2013) conducted research that requires the participation of the whole class wherein the approximately fifty percent of the class experience differentiated instruction; while the rest are introduced to definite instruction. The study concludes that both campuses' students had positive responses to the differentiated instruction, with 90% of respondents expressing greater levels of intellectual development and enthusiasm for the topic. Results show that the majority of the students in differentiated classes exhibited a firm grasp of the core concepts covered in the academic course, according to the assessment of student learning**.** In a classroom where differentiated instruction is practiced, assessment is crucial. To meet learning objectives and achieve learner's proficiency, teacher decides on what instructional strategies to implement based on the assessment results gathered.

In a research performed by Balaus & Salcedo (2019) findings indicated that there were favourable attitudes toward individualized instruction and the implication that differentiated instruction is crucial for the academic achievement of students. They also present an argument that it might be necessary to differentiate instruction when teaching. It is crucial to have a teacher who teaches at several levels to use a variety of instructional techniques to ensure that all pupils receive the same content. The explicit adjustment of education also a task to tailor the outcome to the unique developmental level and skills of a student or group of students is known as differentiated instruction. The ideal scenario is to offer comparable learning activities that take into account each student's individual learning styles while guiding them all toward the same learning goal.

The study of Jocobse et al. (2019) suggested that even though there are various prior studies conducted about the significance of differentiated instruction in classroom practices yet it lacks empirical evidence to raise advantages that proved to contribute in learners' improvement. These study point to some significant gains of differentiated training. They also draw attention to the fact that there are still significant gaps in knowledge. The primary goal of the current investigation is to give a summary of theoretical

conceptions of differentiated education and also advance studies on its efficacy. A comprehensive description of the papers identified reveals how different techniques have been used to implement differentiated education. Findings indicated that differentiated instruction significantly reduced the variety of the classroom.

In a recent study by Valiandes (2015), when differentiated instruction methods were used consistently in classrooms, it was discovered that pupils fared better than those in classrooms where they were not. The idea behind differentiated education is that students should be in charge of growing their knowledge by understanding how they can learn differently and that the instructor should serve as a facilitator of information (Robinson et al., 2014). According to research results, a teacher's ability to implement differentiated instruction has a significant impact on the academic success of their students.

During this time of the pandemic, doing research on a specific strategy is vital (Perez, et al., 2022). Teachers should find a remedy for how to deliver quality instruction in modular instruction (Cabello, 2022; Riconalla et al., 2022). At times, students procrastinate (Olleras et al., 2022) because of losing interest in the subject matter, especially Science. A differentiated instruction strategy can ignite the interest of the students to share their knowledge regarding the topic. However, during this time, parents are the ones accomplishing the tasks (Abucejo et al., 2022) of the students, especially the science activities in the module. If the students are having challenges in understanding science concepts, they can take advantage of the online resources if they have strong internet connectivity (Bahinting et al., 2022). Learners should continue learning even if the unprecedented event – Coronavirus - hinders the quality of education being forwarded to them (Ando et al., 2022). This study can be a manifestation that there's always a way to deliver a topic in the most engaging way possible.

Magayon (2016) conducted a study and reveals that students mostly benefit from the differentiated instruction that the teachers are implementing. Respondents to this study mentioned the following characteristics of this strategy: connecting real-world events to the learning process, changing teaching approaches, tailoring educational experiences to students' interests, teachers' provision during academic experiences, and dividing students into subgroups. This paper made the claim that such differentiated instruction increase students' motivation and achievement by fostering an interest in mathematics among them. Differentiated instruction intends to enhance all students' performance including those who are underachieving and those who are performing adequately.

In the prior years, differentiated instruction has been receiving attention and has been the subject of various research and studies to prove its prevalence in catering to various learning styles to successfully achieved the optimum goal which is the effective teaching-learning process. Yet, few researchers argue that the teachers' misguided implementation of the intervention also affects the efficacy of differentiated instruction. But still, significant research and studies that tackle differentiation in teaching mostly claim its effectiveness and triumph in assessing the learners learning demands. Most eminently, integrating and reviewing these related articles and studies serve as a basis of its vitality to strengthen the framework of the study.

Methodology

This is quantitative research utilizing a quasi-experimental research design. This method is essential in pursuing action research wherein the goal is to test how effective a strategy is by selecting and choosing the respondents to be tested into two sets (the experimental and control group) arranged and controlled accordingly. Both groups had a pre-test and a post-test. A traditional way of teaching the Weather Patterns and Seasons in the Philippines utilized by the control group while the experimental group will utilize the strategy to be tested, which is a differentiated instruction.

Participants

There will be 30 students from Grade 6 of the same section. They will be divided into two – the controlled group (15 respondents) and the Experimental Group (15 respondents). The sampling will run for a week of discussing the topic – Weather Patterns and Seasons in the Philippines.

Instruments of the Study

The study will use the Frequency and Percentage Distribution, Weighted Mean and Two-tailed T-test using Statistical Package for Social Sciences (SPSS).

Frequency and Percentage of Distribution. The frequency and percentage distribution will be used to determine the scores of the respondents in their pretest

and posttest.

Weighted Mean. The weighted mean will be used to describe the level of respondents' academic performance from their pretest and posttest.

Two-tailed T-test. The two-tailed t-test is widely used in establishing critical points of a distribution area whether a sample is greater than or less than a certain range of values. This is also used in proving the acceptance and rejection of the null hypothesis. This parametric test can also be used in the different statistical analyses comparing two sets of values. This statistical tool is essential in knowing the significant difference between the constructs.

Procedures

A letter of communication will be crafted and sent to the Office of the School Principal for approval. After the approval of the letter, the researcher informed the respondents that they will be part of the study. The invitation was set to be voluntary without coercion or any exchange of possible grade accommodation. The ethics of the study were religiously followed. After receiving the confirmation of agreement from the respondents, the researcher divided the respondents accordingly. There were 15 students or respondents per group. After which, the pre-test was administered. The pre-test was designed and construed by the researcher and went through face validity and content validity (Cabello & Bonotan, 2021). The researcher followed Colton & Covert (2007) in designing and validating an instrument. The controlled group had the traditional way of learning the topic which is Weather Patterns and Seasons in the Philippines, while the experimental group had the computer simulation as a strategy in learning the lesson. After which, the administration of the post-test commenced. The post-test was crafted and designed by the researcher and went through the process with the pre-test as their content was just the same. The data gathered will be subjected to appropriate statistical tests set in this study.

A flow chart was created to have a clear picture on how the gathering of data be conducted.

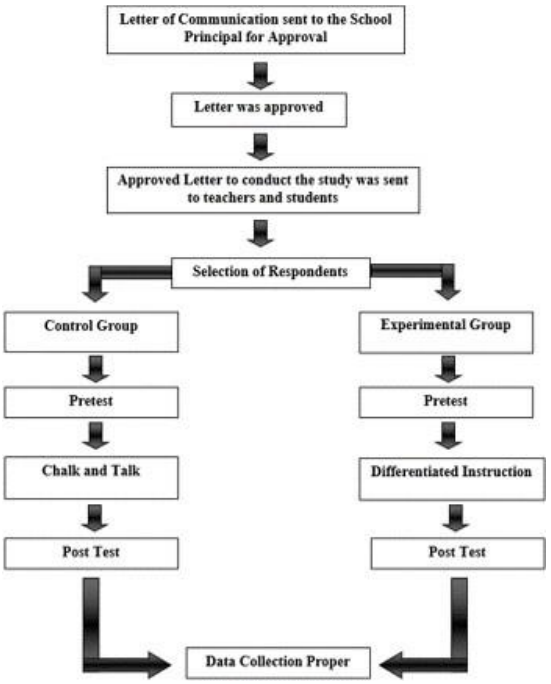

Figure 1. *Flow Chart*

Ethical Considerations

The researchers observed ethical principles throughout the conduct of the study. The researchers maintained the highest level of objectivity in the discussions and analysis of findings throughout the study. Works of other authors utilized in this study in any part of the published articles and highly refereed journals with the use of the APA referencing system were acknowledged. Before the study, the researchers provided an Informed Consent stating the purpose and objectives of the study to ensure that full consent from the respondents was obtained. As suggested by Bryman & Bell (2007), respondents have the right to withdraw from the study at any stage if they wish to do so. The researchers acknowledged the protection of privacy, anonymity, and dignity of the respondents involved in the study as it is of paramount importance. The researchers also ensured that the gathered data from the respondents were given with the highest degree of confidentiality. The respondents were neither harmed nor abused, both physically and psychologically, during the conduct of the research.

Results and Discussion

This part answered the research questions set in this study with discussions and substantiation from the

different peer-reviewed articles.

Research Question #1

1. What is the pre-test result of the two groups of respondents?
   1.1. Controlled Group
   1.2. Experimental Group

Table 1. *Pretest Results of the Two Groups*

Respondents	*Pretest (Controlled Group)*	*Pretest (Experimental Group)*
1	10	15
2	12	16
3	16	15
4	11	14
5	10	13
6	12	12
7	9	12
8	8	11
9	16	11
10	6	11
11	11	11
12	12	11
13	13	8
14	6	6
15	12	3
Mean	11	11
SD	4.00	3.37

Table 1 depicts both the control and the experimental group's pre-test scores. A standard deviation of 4.00 and an overall average of 11 was recorded. The results showed that the control group's highest score was 16, while its lowest was 6, with a score in between. The experimental group, on the other hand, received a mean score of 12 and a standard deviation of 2.69, with a scoring range of 7 to 16. As per the data being collected, a large portion of the experimental and control group students scored below the Department of Education's benchmark of 75%.

The findings of the two groups indicated that learners exhibit a dearth of understanding of the topic - Weather Patterns and Seasons in the Philippines. Several Earth Science topics were thought to be challenging, dull, or seemingly insignificant by students (Dawson & Carson, 2016). Findings of the study conducted by Wickman et al. (2016) reinforce the fact that primary students never establish an interest in science, as opposed to losing it over time. This is supported by the study conducted by Lauermann et al. (2020) emphasized his argument that a group of performing students may have a positive response but does not necessarily mean that it affects their individual knowledge when it comes to standardized test performance.

The results obtained, from the two groups showed that these students only have a basic understanding of the topic of weather patterns and seasons in the Philippines. This directory can be used to assess the type of intervention we ought to use to fill this gap. It is essential to make use of a variety of educational strategies to effectively elaborate on the topic at hand. Learners can comprehend and assimilate difficult ideas in this manner, which can aid in the elaboration of their knowledge about the subject matter.

Research Question # 2

2. What is the post-test result of the two groups of respondents?
   2.1. Controlled Group
   2.2. Experimental Group

Table 2. *Posttest Results of the Two Groups*

Respondents	*Posttest (Controlled Group)*	*Posttest (Experimental Group)*
1	4	17
2	6	17
3	6	16
4	7	16
5	7	15
6	7	15
7	8	15
8	8	14
9	11	14
10	14	13
11	12	11
12	13	10
13	14	9
14	15	9
15	15	6
Mean	10	13
SD	3.64	3.24

Table 2 presented assessment results for the experimental and control group using differentiated instruction and the traditional method of teaching the subject matter. The results indicate that the control group's mean is 10, and its standard deviation is 3.64, with a maximum score of 15 and a minimum score of 4. Meanwhile, the experimental group's data showed that their mean score was 13, and their standard deviation was 3.24, with a mean score of 13 and the lowest score of 6, respectively. As a result, it can be

seen that the control group's performance deteriorates whilst the experimental group indicates improvement in their academic performance regardless of the method of instruction used during the discussion.

Krajcik et al. (2014) assert that the components of the disciplinary core ideas will need to be combined with different methods and strategies and contextualize key concepts so as to direct students in acquiring competency in performance expectations of the subject matter. Specifically, Laronde & Mcleod (2012) claimed that the Chalk and Talk lesson was thought to be easier to prepare because it allowed for more control over the information being taught to a big number, but it turned out to be quite compelling for some due to the lack of engagement within the class. They also came to believe that one of the drawbacks of using traditional methods of teaching was that it could be more tedious to students, does not interfere with visual or kinesthetic learners, and had little active participation. On the contrary, Dixon et al. (2014) emphasize that implementing differentiated instruction is logical in considering learners' differences in terms of strength, capabilities, and interests for it finds ways for alternative approaches, methods, and outcomes.

The experimental and control groups' scores were significantly different, according to the results, implying that the teacher's approach to instruction has a distinct effect on the student's understanding of the topic of weather patterns and seasons in the Philippines. These results support the notion that the teaching strategy as a whole influences students' learning.

Research Question #3

3. Is there a significant difference between the pre-test and post-test scores of the controlled and experimental groups?

Table 3. *Pretest and Posttest Difference between Controlled Group and Experimental Group*

Group	*n*	*Df*	*t-value*	*p-value*	*Interpretation*	*Remarks*
Controlled Group	15	14	-0.836226	0.41707	Not Significant	Accept the Null Hypothesis
Experimental Group	15	14	5.802475	0.00005	Significant	Reject the Null Hypothesis

**Significance level is at p < 0.05*

Table no. 3 contrasted the experimental group's pre- and post-test results and the control group using the interpreted data. The table revealed that the controlled group's pretest and post-test results were not significant with a p-value of 0.42; however, the experimental group's results for both tests indicate a significant result with a p-value of 0.00.

The table showed that the posttest results for both groups differed from their pretest results. This implies that students who take the test without having the necessary knowledge have acquired a different level of understanding when they took the test using both strategies—the conventional method and the novel strategy. The table further revealed that the way it is presented in differentiated instruction uses extensive information to validate the lesson and efficiently discusses the subject in a way that a student can comprehend, which the traditional approach may improve.

According to the study by De Jesus (2012), she found that upon studying some learners like using visual aids, others prefer speaking in groups or with a partner, listening to instructions, and yet more prefer being physically involved. Differentiated instruction encourages curiosity, commitment, and consciousness in the classroom. Student preferences, interests, competence, and learning preferences are the main topics of differentiated education. It promotes personalized scaffolding, structured lessons, and dynamic groupings. Pham (2012) stated that differentiated instruction is effective if it meets expected learning outcomes. Above all, what is significantly important is for teachers to evaluate the background of their learners to choose appropriate interventions to implement and assess where to provide something. The success and productivity of implementing differentiated instruction are not in the application, but rather, it is evident in the actual integration of the teacher from his in-depth discernment of students' needs (Geel, 2018).

The efficacy of an intervention confides in meeting the needs of diverse learners inside the classroom. It has always been a great dispute when we talk about the appropriateness and effectiveness of a strategy implemented in a subject matter. With differentiated instruction in hand, various researchers ratify the claim and have proven its favorable result and response from the learners. Based on data gathered, it is evident that learners show positive outcomes with differentiation as their intervention compared to the conventional way of teaching. It only means that the productivity rate of the said strategy goes to show how students are more engaged with the lesson.

Conclusion

Differentiated instruction is widely known as an effective intervention in enhancing classroom interaction and collaboration and most especially in catering to learners' differences. Weather Patterns and Seasons in the Philippines is a relevant and relatable topic that has also been given less emphasis because of the assumption that students already have enough prior knowledge about it. Due to this disregard, it is an optimum goal to corroborate the notion of utilizing discrete intervention with an aim to appraise the learning experience of learners. Based on the gathered data presented implies that the utilization of new intervention shows that the topic is better discussed and students show a high level of understanding of the topic compared to the traditional way of teaching. This goes to show that in today's 21st-century classroom which is composed of learners with different needs, multiple intelligences, and abilities, an intervention that could cater to the diversity of these learners is the best option to elevate the learning experience in teaching an overlooked topic like the said.

After a thorough analysis of data, it is recommended to make use findings of the study as a guiding hand in curriculum planning directed for effective teaching and learning process. For validation, future researchers can make use of the findings presented as a basis for further study. The same study can also be tested to different set of respondents and/or utilize the same strategy to different topic, otherwise.

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