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LITERATURE-BASED APPROACH IN DEVELOPING SCIENTIFIC SKILLS AMONG YOUNG CHILDREN

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ABSTRACT

Developing scientific skills among learners is the aim of every country. Children are curious about the things around them. Hence, they should be provided with science lessons that will help them develop scientific skills. Literature-based approaches (LBA) can be used in teaching science to young children. To determine the effectiveness of the Literature-Based Approach in developing scientific skills among young children, this study utilized a quasi-experiment approach. The participants were kindergarten teachers and pupils (N=27) from a public elementary school. The pupils were divided into groups of non-story (n=11) and story (n=16). In investigating the effectiveness of LBA, pretests were given to the two groups of kindergarten pupils to ensure validity and reliability. With the use of Pear Deck as an application in administering tests during online classes, it was found that there were no significant differences between the two groups in their pretest scores, thus making them suitable for the study. The data was analyzed, and after applying the two approaches, a post-test was administered. The results showed no significant difference between the post-test results after applying non-story science teaching and the Literature-based approach in the non-story and story groups. However, the study concluded that LBA effectively develops scientific skills due to the noticeable improvement of children's skills in describing, analyzing, predicting, and inferring based on the mean scores of pretests and post-test. Recommendations include further training of teachers in implementing lessons utilizing the LBA and assessing their impact on class participants.

Key Words: Literature-based Approach (Lba), Scientific Skills, Science, Young Children, Teaching Method, Kindergarten, Teaching Approach.

1. INTRODUCTION

In the present society, educational reforms are taking place in most countries globally. Countries are doing their best to identify and implement programs that will suit the demand of international standards. One of the subjects that has been receiving much attention in terms of educational reform in science (O'Connor, Fragkiadaki, Fleer and Rai, 2021). According to Upahi, et al. (2017), greater emphasis was given to science due to the principle of science for all to achieve scientific literacy among children.

In the Philippines, the educational system also gives importance to developing scientific literacy (Palines, Ortega-Dela Cruz, 2021). Various science-related programs were developed to help Filipino children acquire scientific skills, starting from the preschool level. The Kindergarten Curriculum Framework of the Department of Education (DepEd) includes science as one of the most critical domains. The curriculum includes science topics such as the human body, plants, animals, and matter. This early integration of science in the education curriculum has its basis in Olcer (2016) who reiterates that the early childhood period is where each child establishes the

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framework of human life. During this period, preschool students learn about their physiological components and the things around them based on their early experiences. These experiences can lead young children to develop an interest in science.

Children are born with a natural curiosity even before entering school (Jirout & Klahr, 2012). They want to know and discover many things around them. They wonder about what is happening in their body and the different phenomena in their surroundings (Stephens, 2007; Jirout, 2020). Children's natural curiosity can be addressed through different science activities (Kibga, Gakuba, Sentongo, 2021). Hadzigeorgiou & Schulz (2019) considered science the most challenging and exciting subject for children. The active and hands-on activities made science an interesting and stimulating subject for children, as compared to mere listening or memorizing. Likewise, science activities could help children become interested and aspire to become future scientists. However, the method of teaching of the subject has caught the attention of many educators. Various researches related to curriculum and instruction are done to find effective ways of teaching science (ÇİMER, 2007). The traditional way of teaching science has been found to be relatively unsuitable for children to understand science concepts nor conducive enough to develop their love for science, therefore leading them not to pursue science courses in the future.

Emergent literacy involves the development of reading and writing skills among children (Septiani & Syaodih, 2020). One of the best ways to help children develop these skills is through stories. Children enjoy books, songs, and stories; and they have been able to visualize stories just by looking at the picture or reading them. Storytelling promotes brain development and sparks imagination, enhances language skills, stimulates curiosity and emotions, helps define the difference between reality and make-believe, and strengthens inter-personal relationships. Johnson & Krishnan (2014) stated that children's exposure to stories helps them analyze text and develop literacy skills through real-life experiences. Moreover, a research claims that integrating literature can create a learning environment and provide comprehensible input (Rodrigo, Greenberg, & Segal 2014).

The literature-based approach (LBA) is an approach to instruction that aims to teach children using a piece of literature to enjoy and learn skills as needed (Harp & Brewer, 2005). Likewise, it is an approach that develops literacy among children wherein the author utilizes original and expository works as the core of experiences (Cox, 2012). Storytelling is the most common way when using this approach, with the teacher utilizing this approach using storybooks as their primary instrument. The Philippine Department of Education gives importance to storytelling as part of the students' learning experience. The storytelling activity is included in the kindergarten block of time (DepEd Order No. 47, 2017) where the teacher tells any story to the children and asks questions about the story to gauge their understanding of the story.

Many literatures contain stories that talk about science concepts which teachers can use to help children learn skills related to science. Using the literature-based approach in teaching young children enables them to engage in scientific activities, develop scientific skills, and promote a scientific attitude. In a study by Walan (2017), she reiterated that the science curriculum aims to develop children's curiosity in science and increase their sense of wonder and enthusiasm, which can be achieved through stories. Hadzigeorgiou (2016) added that children understand different science concepts through stories. Rolsan (2015) stated that stories could be a powerful tool if used successfully around the curriculum, particularly in science. While listening to a story, children may learn to analyze, infer, classify, sequence, and draw conclusions, and these are essential basic science skills.

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This study's purpose is to determine the effectiveness of the Literature-based Approach (LBA) in developing scientific skills among young children. Specifically, this study seeks to answer the following questions:

1. What is the level of children's scientific skills before and after the application of Literature-based Approach as teaching method?
2. Is there a significant effect of using the Literature-based Approach in developing scientific skills among young children?
3. What Literature-based Instructional Plan can be crafted to develop scientific skills of young children?

The research aims to determine how teachers, through the use stories, could help children develop the skills of observing, classifying, measuring, communicating, inferring, and predicting. Also, it seeks to observe children's engagement in science even at a young age that will eventually lead to taking science-related courses in the future. As Ata Akturk, Demircan, Senyurt, Cetin (2017) reiterated, early exposure of young children to science-related activities might lead to an early desire to experience and investigate the world of science.

2. METHODOLOGY

The study mainly employed a quasi-experimental research design. Two groups of pupils are formed: the first group is called non-story class, and the second group is the story class. The non-story class was provided with science lessons that used pictures and slide presentations to impart the science concept. On the other hand, the story group was provided with Literature-based Approach instruction where a story was used to present the lesson. The same science topic was presented to both groups.

The data sources for this study were from the results of researcher-prepared pretest and post-test given to both non-story and story groups. Kindergarten teachers and science experts validated the test. The test was composed of 20 multiple-choice items about the legs of animals. A table of specifications was made to identify the skills to be measured based on the pupils' test results focusing on scientific skills. The number of items and item placement were included in the table. The score of the pupils from the pretest and post-test were used as data for the study. The scores were presented using the mean score and compared using an independent sample t-Test.

Research Locale

This research was conducted in a public elementary school located in Calumpit, Bulacan. A written permission from the division office was obtained before conducting the study to the target school. The school was selected due to the following reasons: 1) it is one of the most prominent public elementary schools in that district; 2) due to the COVID-19 pandemic, the school conducted online classes for kindergarten, and 3) the principal and teachers of the school showed willingness to participate in the study.

Research Participants

The study was participated by a kindergarten teacher and pupils. The teacher was selected based on the recommendation of the school principal, as well as the teacher's experience in teaching kindergarten classes. The teacher finished Bachelor of Elementary Education major in

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Preschool Education with units in master's in education, and has eight years of experience handling this kind of pupils.

A total of 27 kindergarten pupils participated in the study. They were divided into two groups: 11 pupils were placed with the non-story group, while 16 were part of the story group. The pupils are selected based on convenience sampling due to the current pandemic situation. The criteria for the pupils' participation were: 1) teacher's nomination; 2) availability of facility and internet connection in the child's house; 3) permission from parents, and 4) willingness of the pupil to participate. The purpose of the study was presented to the parents in the form of a written parental consent that sent through online messenger app and email. The parental consent also stated that the pupils were not forced to participate in the study.

Data Gathering Procedure

The data for this study were collected based on the following phases:

Phase 1 – Pretest. Before implementing the lessons, each group of pupils was given a researcher-made test using the Pear Deck application. It is an interactive presentation software used by the teachers to encourage the active participation of the pupils during the assessment. A code was given to the class for them to access the test. The teacher assisted the pupils in entering the test and taking the test because this is new to the pupils. The teacher made a slide presentation of the questions using Google slide and set it to Pear Deck application. Each question appeared on the screen in real-time. Due to the age of the participants, the teacher read the questions and choices aloud and waited for everyone to finish answering before proceeding to the next question. The scores of the pupils were automatically computed after the administration of the test.

Phase 2 – Implementation of the Lesson. After the pupils underwent a pretest, the teacher employed a science lesson to the non-story and story group. The following are the steps in instructional plan in teaching science: (a) review, (b) motivation, (c) presentation, (d) discussion, (g) generalization, (h) application, and (g) evaluation.

For the non-story group, the teacher utilized instructional materials like pictures, slide presentations, songs, and videos relevant to the formulation of the science concept for the pupils to develop fundamental scientific skills.

For the story group, the same teacher, employed the LBA approach in teaching the same topic, "Animals and Their Number of Legs." Like in the non-story, LBA also followed the same procedure except that, during the discussion, the teacher utilized a story, a fable in particular. Since Philippine Literature also deals with fables, the teacher used illustrations to make the storytelling more enticing to the pupils and enabled them to visualize animals' legs as part of the development of their scientific skills. The teachers raised questions related to the story, but the questions are aimed at formulating concepts about the animals' number of legs. The questions asked by the teacher were also focused on developing scientific skills such as observing, comparing, classifying, analyzing, and predicting.

The classes were conducted using Zoom or Google Meet platform due to the Covid-19 pandemic and in observance of the health protocol issued by the local government in the province.

Phase 3 – Post-test. The last part focused on the administration of the post-test. After each lesson presented to the non-story and story group, a post-test was administered to the pupils of both groups. The post-test was presented using the Pear Deck application. The same procedure was done on how the pupils could access the test, and the teacher assisted the pupils in answering

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the test. The scores gathered from this phase were compared to the pretest scores of pupils from each group.

Data Analysis Procedure

The data gathered from the researcher-made pretest and post-test results for non-story and story groups were presented and compared. The level of the children's scientific skills in both tests was analyzed using the mean score. An Independent Sample T-Test was the statistical treatment used by the researchers to determine if there is a significant effect of using LBA in developing scientific skills among young children. Independent Sample T-Test is a parametric test that compares the mean of the two independent groups to identify a significant difference between the two groups.

3. RESULTS AND DISCUSSION

The Level of Children's Scientific Skills based on the Results of Pretest

A pre-test was given using Pear Deck application to the pupils belonging to the non-story group and story group of the target class before implementing the lesson for each group to determine the level of children's scientific skills. The test was composed of 20 items on animals and their legs, and items were identified based on the researcher-made table of specifications made. The table of specifications was composed of 7 different science objectives focused on identifying, classifying, groupings, describing, analyzing, predicting, and inferring. These skills are essential in the development of scientific skills.

The pretest results given to the non-story group, composed of 11 children, were computed using the mean score. As shown in Table 1, the competency with the lowest mean score, 0.58, was analyzing skills. The data showed that the children need to be provided with learning experiences that focus on analysis. This skill is essential for children even at a young age because they can use it in different situations, particularly in identifying and finding possible solutions to future problems.

The data showed that competency that measured children's ability to classify is the third-lowest in the table with a 0.67 mean score. The skills in predicting have a mean score of 0.66, which was the second-lowest score, and this data showed that children in the non-story group need to develop the predicting skill with the teachers providing learning experiences that focus on this skill. Further, the mean score revealed the need for children to be given more exercises in classifying.

Describing the animals based on their attributes has a mean score of 0.75, the highest. This data revealed that children know the characteristics of animals. They may be familiar with the animals presented in the items, hence they can quickly answer items related to this skill.

Table 1. ***Mean Score of Pretest in the Non-story Group***

Competencies	Mean Score
Identify the number of legs of animals.	0.69
Classify animals according to their number of legs	0.67
Group animals according to number of legs	0.71
Describe animals based on attributes.	0.75
Analyze a problem/situation	0.58
Predict the animal that does not belong to the group.	0.66

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Infer the number of legs of each animal.	0.72

Note: n = 11 pupils in the non-story group who took the pretest.

A pretest was also administered to the story group. The pretest result showed that basic skills such as identifying which may be acquired from observing have a mean score of 0.72 (as shown in Table 2). This mean score is the lowest among the competencies included in the table of specifications to measure the scientific skills of young children. These results may suggest that teachers should give this group of children more opportunities to observe things and events in their surroundings.

The ability to infer events was the skill with the second-lowest mean score of 0.79. The majority of children did not answer the question about inferring correctly. Hence, this may be interpreted as children lacking experience in situations that require inferring skills.

On the other hand, the pretest results for the story group showed that skills of grouping and describing having the highest mean score or 0.96. This data may imply that children can group animals and have known the essential characteristics of animals included in the test.

Table 2 ***Mean Score of Pretest in the Story Group***

Competencies	Mean Score
Identify the number of legs of animals.	0.72
Classify animals according to their number of legs	0.93
Group animals according to number of legs	0.96
Describe animals based on attributes.	0.96
Analyze a problem/situation	0.93
Predict the animal that does not belong to the group.	0.84
Infer the number of legs of each animal.	0.79

Note: n = 16 pupils in the story group who took the pretest.

The pretest results of the non-story and story groups are different. The children in the non-story group showed a low mean score in skills such as analyzing and predicting. In contrast, the results of pretest or children in the story group revealed the weakness of children in answering questions related to basic skills like identifying and inferring.

The Level of Children's Scientific Skills based on the Post-test Results

After implementing both types of lessons, a post-test was administered to the non-story and story groups. The same test was given to each group of children using the Pear Deck application. In presenting the items, the teacher read each question and choice aloud, waited for all the children to answer. Each child's scores for both groups were collected, classified, analyzed, and compared. The mean score for each skill stated in the table of the specification was computed and compared to see the skills with the highest and lowest mean score based on the results of the test.

Table 3 showed post-test results indicating that the skill with the highest mean score of 0.91 was analyzing skill. In comparison, the skill of describing has a mean score of 0.87. Further, the skills of predicting and inferring both have a mean score of 0.83. The results showed that most of the children can apply the skills of analyzing in the situations they encounter. Due to the

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familiarity with the different animals used in the test items, children were able to answer questions that needed the skills of describing. Moreover, the results indicated that children might have the skills of predicting and inferring as these two skills have the third-highest mean scores.

Table 3 Mean Score of Post-Test for Non-Story Group

Competencies	Mean Score
Identify the number of legs of animals.	0.69
Classify animals according to their number of legs	0.80
Group animals according to number of legs	0.79
Describe animals based on attributes.	0.87
Analyze a problem/situation	0.91
Predict the animal that does not belong to the group.	0.83
Infer the number of legs of each animal.	0.83

Note: n = 11 pupils in the non-story group who took the post-test.

The mean scores for the story group are presented in Table 4. The results showed that the highest mean score of 0.91 was for the objectives that require children to classify and analyze. The skill that requires children to group has the mean score of 0.90, the second highest, and the third-highest skill is describing with a mean score of 0.87. The results revealed that most children could classify and analyze in the story group, and they could use these skills in answering items in the test under the said skills. However, the results indicated that predicting and inferring got the lowest mean score of 0.79.

Table 4 *Mean Score of Post-Test for Story Group*

Competencies	Mean Score
Identify the number of legs of animals.	0.83
Classify animals according to their number of legs	0.91
Group animals according to number of legs	0.90
Describe animals based on attributes.	0.87
Analyze a problem/situation	0.91
Predict the animal that does not belong to the group.	0.79
Infer the number of legs of each animal.	0.79

Note: n = 16 pupils in the story group who took the post-test.

The post-test results for both groups of children showed that following the implementation of the lesson, the skill of analyzing has obtained the highest score, indicating that the children in both groups have learned how to analyze. Analyzing is one of the essential skills children need to acquire in science, particularly when encountering different situations or phenomena.

Comparison of the Test Results of Non-story and Story Groups

To investigate the effectiveness of LBA in developing scientific skills among children in teaching science, pretests were given to the two groups of kindergarten pupils to ensure the validity and reliability of the study. With the use of Pear Deck as an application in administering the pretest during the online classes, it became apparent that there was no significant difference between the

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two groups, thus they were considered suitable for the study. Since the data obtained presented a normal distribution, the pretest results of the two groups were evaluated, and shown in the table below.

The results were analyzed within a 95% confidence interval (5% error margin). With the value higher than 0.05, this indicates that there is no significant difference between the pretests of the two groups where the contemporary science teaching approach and LBA will be used (m =13.5455, s=6.63873 and m = 17. 4375, s = 2.06458 respectively with t = 2.212, p =.36) before the application of the two different approaches.

Table 5. ***T-Test Result of Pretest Scores According to Groups***

Group	N	M	SD	t	P
Non-Story	11	13.5455	6.63873	2.212	0.36
Story	16	17.4375	2.06458	1.883	0.86

*Significant level p < 0.05

After applying the two approaches, a post-test was administered online using the Pear Deck application. The researchers were present during the post-test administration and gave the kindergarten pupils instructions on the procedures for the test. Same as the pretest result, the data obtained presented normal distribution. Using Independent T-Test, the results are shown in Table 6.

Table 6 ***T-Test Result of Post-Test Scores According to Groups***

Group	N	M	SD	t	P
Non-Story	11	16.8182	4.49039	.169	0.86.7
Story	16	17.1250	4.74517	.170	0.866

*Significant level p < 0. 05

Data were analyzed within the 95% confidence interval. Looking at the p higher than 0.05, this indicates that there is no significant difference between the post-tests of the two groups where the contemporary science teaching approach and LBA were employed in presenting the lesson (m =16.8182, s= 4.49039 and m = 17. 1250, s = 4. 74517 respectively with t =,169 p = .0867) after the application of the two different approaches.

Proposed Literature-based Instruction for Young Children

Based on the results of the data gathered, the researchers have come up with the proposed Literature-based Instructional Plan for the kindergarten level that focuses on the development of scientific skills. The instructional plan is patterned after the five-part lesson plan, which is being taught in pre-service teachers at the College of Education. The instructional plan adopts the principle of cognitivism and constructivism, where young children are encouraged to formulate their ideas in relation to the topic. Furthermore, it follows the outcomes-based principles, which is one of the thrusts of the Philippine Department of Education (DepEd).

The instructional plan is written in Filipino or Tagalog dialect as DepEd mandates that the medium of instruction for teaching from kindergarten to Grade 3 levels should be the mother tongue. However, due to the nature of the subject, there are scientific words that do not have a direct translation in Tagalog, hence some terms are presented in English.

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The first part of the instructional plan is the objectives. The objectives are specifically directed to evaluate the pupils' learning experience and the anticipated outcomes. It is composed of low-order and higher-order thinking because the researcher believes that low-order thinking is also essential, particularly for the level of the pupils. However, the objectives emphasize higher-order thinking skills and basic scientific thinking skills.

The second part focuses on the subject matter. It is composed of the target topic to be presented to pupils on that particular day. References are provided for teachers and pupils as well. It has additional references that pupils can read to obtain deeper knowledge on the topic presented to them. A list of materials to be used in the lesson is included to help the teacher prepare and execute a smooth presentation. Another vital element of this part is the list of scientific skills that pupils are expected to learn from this lesson and a list of scientific words. The list of scientific terms is included so that pupils can become familiar with these words at an early age. Lastly, the list of scientific terms will serve as guide to the teacher on the lesson's focus and the concepts that the pupils are expected to learn.

Part three of the instructional plan is the procedure. This part is the lesson proper, and it is composed of several subparts. The lesson proper will start with the daily routine of the class. Setting a routine is essential for teachers in a kindergarten classroom. After the daily routine, the teacher will proceed to unlock difficulties. In this part, the teacher will present some parts of the story that could help pupils understand the story quickly. The teacher will use easy-to-understand words in a simple sentence that children can comprehend.

Engaging and motivating pupils is essential in the teaching and learning process. If teachers engage and motivate pupils, the teachers will successfully present the lesson because the pupils' attention will focus on the lesson. In this instructional plan, two types of motivation are presented. These are the motive question and the motivation question usually included in a lesson that uses a story. Motive question is left hanging until the last part of the reading proper, and it is related to the story. At the same time, the motivation question is related to the general behavior or the pupils' lives.

The following subpart under the lesson proper is the presentation of the story. This research suggests using stories for children written by a Filipino author. Further, stories should have science-related ideas. For example, the researchers used stories such as "Kamatis ni Peles (Tomato of Peles)" which discussed the needs of a plant, "Kain, Kumain, Kinain, (Eat, Ate, Eaten)" which talked about the food chain, and "Munting Patak Ulan (Tiny Rain Drop)" which discussed the water cycle. In presenting the story, the teacher will ask one or two questions related to the part of the story being presented. These questions help the teacher assess if the pupils understand or follow the flow of the story.

After the story's presentation, various science activities are presented to the pupils. They will use simple and easy-to-find materials in doing experiments. For example, the pupils are encouraged to use available materials to experiment on the water cycle; or the teacher can also ask the pupils to plant seeds and observe the growth of the seeds so that they will understand the basic needs of plants. In these experiments, the pupils are encouraged to communicate their answers to the class and present what they have observed.

The pupils will be asked to generalize what they have learned from the lesson presented by the teacher. In this subpart, the teacher can assess what the pupils learned. For instance, there are paper-and-pencil activities presented to the pupils in the application part. Here, teachers can assess the learning and progress of the pupils after performing the activities.

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Determining the pupils' progress is an integral part of the learning process. In this instructional plan, evaluation is included. The teacher can offer various activities that can be used to evaluate pupils' progress. The evaluation should be congruent with the objectives of the lesson.

The last part is the assignment. Many neglected the importance of assignments. In this study, an assignment is included and forms an integral part of the learning process. The assignment for this instructional plan is an extension of the lesson being presented. Aside from that, it could develop study habits among pupils and strengthen the participation of parents in the study of their children.

5. CONCLUSIONS

The following conclusions were derived from the study results:

The study showed that children from both non-story and story groups had already acquired scientific skills before taking the pretest. Children from both groups have skills in describing and classifying animals based on the pretest result. Some pupils may learn these skills through their everyday experiences. This result implies that teachers must provide learning experiences that enhance and help children learn other scientific thinking skills.

The general results of the pretest and post-test revealed no significant difference between the scores of children in non-story and story groups. However, children showed improvements when looking at the mean scores for each competency. After implementing the lesson, children showed improvement in describing, classifying, analyzing, predicting, and inferring skills. These skills are scientific skills that children can use when they encounter various phenomena in the future.

The lesson plan proposed in this study used stories not just to motivate children, but as a springboard in teaching and developing basic scientific skills among young children. The story should be culturally related to the target participants, interactive, and incorporate hands-on science experiences. There is a need for the teacher to carefully study the story first before using it in class. Further, various questions were asked to develop comprehension and thinking skills essential for the children to learn.

6. RECOMMENDATIONS

In view of the above conclusions, this study recommends the following:

The Philippine education gives much value to science and the development of scientific skills. Hence, even at the kindergarten level, teaching and developing scientific skills must be emphasized by exposing teachers to effective ways of teaching science to young children, like using the Literature-Based Approach (LBA).

Telling stories to children is included in the schedule of kindergarten classes as stated by the Department of Education. However, the results of the study showed a need to enhance the storytelling skills of teachers. The kindergarten teachers should be provided with workshops/training on using the Literature-based Approach (LBA) to integrate science concepts into class lessons.

There is a need to conduct further studies to solidly establish the significant effects of utilizing LBA in developing scientific skills among young children. Specifically, future researchers are encouraged to conduct further investigations without the presence of the parents and to administer the post-tests in the actual classroom setup for more accurate and ecologically valid results. There is also a need to investigate the effectiveness of LBA at a macro level in order

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to determine the impact of such method when applied or utilized in a wider number of pupils in both public and private schools in the Philippines.

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