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EXAMINATION OF PIRLS AND TIMSS INTERNATIONAL ASSESSMENT RESULTS OF PRIMARY SCHOOL STUDENTS THROUGH DISCOVERY LEARNING MODEL AND "PULL-PUSH" TECHNOLOGIES

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ABSTRACT

In this article, the extent to which elementary school students acquire innovative and information and technology literacy in accordance with the requirements of the times in order to develop 21st century life skills of reading literacy in the six-year PIRLS international tests is studied.

The analysis of the 2021 PIRLS research has made comments on the level of reading literacy of the 4th graders of Uzbekistan compared to the rest of the world.

The use of discovery and project-based learning approaches that enhance the literacy skills of elementary teachers and students can help address these issues.

The main purpose of this study consists of two parts: 1) To determine the reading literacy skills of elementary and future elementary school teachers based on the assessment of minimum competence; 2) by analyzing the effectiveness of the learning model after the introduction of the skill of improving reading literacy of primary school students, the mechanisms of achieving the result are shown.

The model allows not only elementary school teachers, students, and elementary school students to effectively design the level of development of reading literacy of students and students, to assess the level of achievement of didactic, international-level methodical goals set in the application of innovative methods.

KEY WORDS: *OECD, PIRLS, Discovery Learning, Minimum competence, Stimulation, Singapore, Indonesia, Levene's test, Paired Sample T-test, STKIP method of discovery learning model.*

INTRODUCTION

Great emphasis is being placed on the significant reforms in our country's education sector because schools are now measuring the extent to which students acquire real-life skills according to set standards. This effort is reflected in key documents as well as in strategies and roadmaps outlined in laws and decrees.

For instance, Uzbek legislation and directives such as the Cabinet of Ministers' Resolution No. 997 of December 8, 2018, on "Measures to Organize International Assessments of Educational Quality in the Public Education System," assign priority tasks to organize and participate in international assessment programs like PIRLS, TIMSS, PISA, and TALIS, as well as to conduct fundamental and applied research on educational quality assessment. [1]

Similarly, the Presidential Decree No. PF-5847 of October 8, 2019, "On Approval of the Concept for Developing Uzbekistan's Higher Education System until 2030," sets forth the development of flexible curricula, educational programs, and strategies based on international experience as one of its target indicators. [2]

Additionally, the priority tasks of the Development Strategy of New Uzbekistan for 2022-2026 include taking the quality of education to a new level. By 2026, it is planned to thoroughly revise and implement curricula and textbooks based on advanced foreign experience. [3] Hence, with clear strategies and roadmaps, a well-structured mechanism must be established to achieve higher rankings in international assessments, working continuously with current and future educators. Learning from international experiences and techniques is therefore deemed necessary. In today's world, the education paradigm that forms the foundation of learning must undergo fundamental changes to align with the demands of 21st-century education. The education of the 21st century must ensure that each individual acquires learning and innovative skills, as well as competencies in using technology and information tools, and the ability to live and work with these critical skills.

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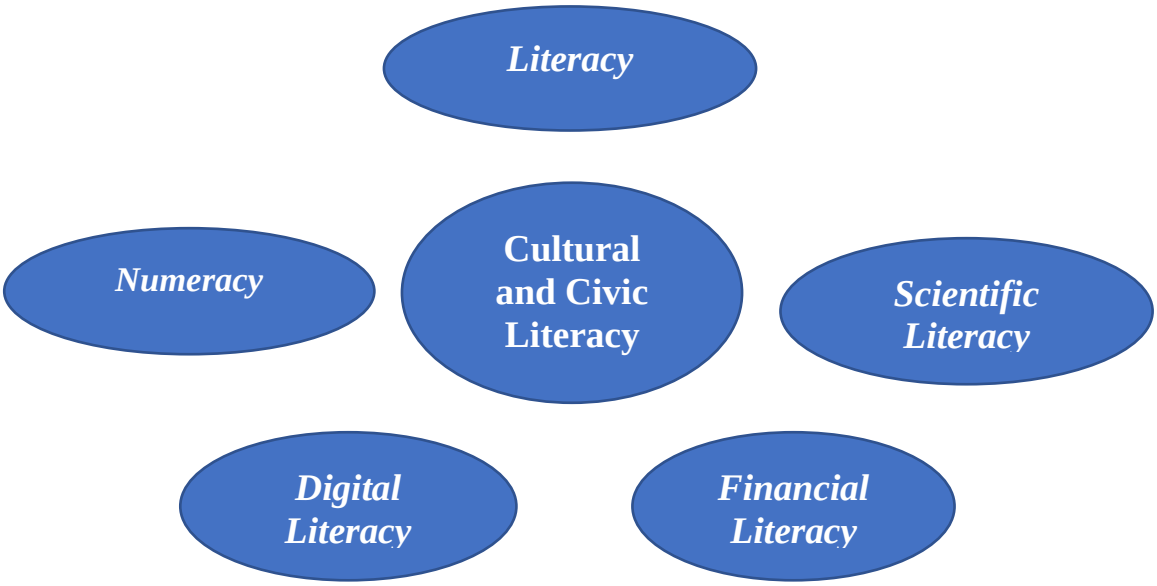
These essential abilities are increasingly referred to as 21st-century skills. Various organizations and institutions have tried to explain and identify the skill sets needed for life and work in the modern world. The role of the education system in preparing individuals capable of competing in the future is now a well-recognized necessity. [4]

LITERATURE REVIEW

Within the scope of this topic, several literary sources were examined. These include OECD (2010), PISA: Reading, Mathematics, and Scientific Literacy, published in Paris, and speeches by Joseph. The analysis of articles by G. A. Tsukeman, G. S. Kovaleva, and M. I. Kuznetsova, entitled Success in PIRLS and Failure in PISA: The Fate of Reading Literacy among 10–15-Year-Old School Students, shed light on the dynamics of reading literacy as observed through the international assessment programs PIRLS and PISA. The "Pull-Push" diagnostic technique, which tracks the dynamics of students' reading literacy in these programs, was explored as a method for improving reading skills. To obtain reliable data on the reading literacy dynamics of primary school students, the "Push-Pull" technique identified parameters that aligned with the sample criteria of 4th, 6th, and 9th graders.

Literacy is defined as an individual's ability to read, write, speak, calculate, and solve problems at a level of proficiency necessary for functioning effectively at work, in the family, and in society.

CORE LITERACY IS DIVIDED INTO SIX TYPES



Reading literacy is not just about knowing the content or meaning of what is read; it is the true ability to read, as well as the capability to understand reading concepts. To achieve this, we must assess students' reading literacy, meaning we should also evaluate their ability to think critically and articulate ideas using language.

Empirically, Indonesian students' reading literacy still requires improvement at the international level. Literacy assessment tests conducted by the Progress in International Reading Literacy Study (PIRLS) show that fourth-grade primary school students can only adequately answer a few of the questions on artistic and informational texts. This issue is also reflected in survey results conducted by the OECD.

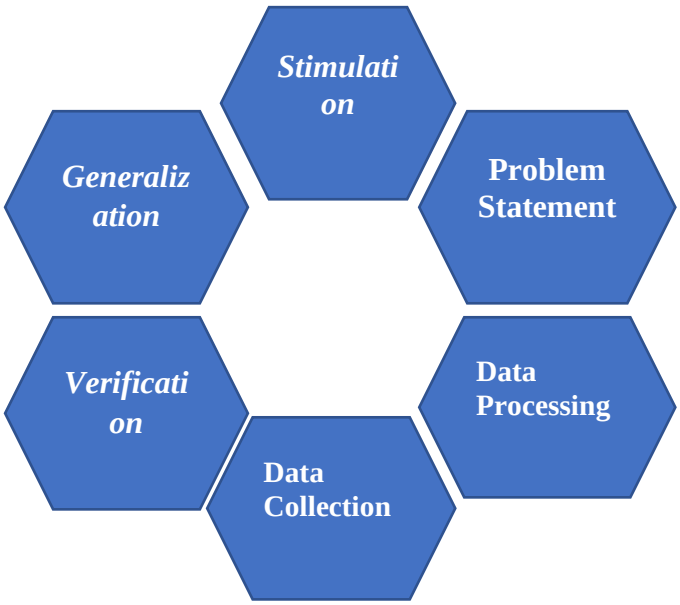
In 2018, among 79 countries participating in the PISA reading literacy assessments, Indonesia ranked 74th, Thailand 68th, Malaysia 58th, and Singapore 2nd. In the 2021 PIRLS assessment, Uzbekistan ranked 49th out of 57 countries.

One of the factors contributing to students' low reading literacy levels is the habits and attitudes modeled by teachers. Primary school teachers, as well as teacher trainees studying primary education curricula, need to possess strong reading literacy skills. These issues can be mitigated by applying a proper learning model. The discovery learning model, for example, helps students enhance their reading literacy skills. Discovery learning is a model where students improve their knowledge by conducting experiments and discovering principles through their own exploration. [4]

As Bruner pointed out, the discovery learning model enables students to discover new rules and ideas rather than merely remembering information conveyed by teachers.

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DISCOVERY LEARNING MODEL'S SIX SYNTACTIC ELEMENTS



Students are presented with problems related to the concept of lecture materials, while the teacher acts as a guide, enabling the students to independently uncover the concepts. Using the discovery learning method, students can locate and read various books or articles, documenting their findings in individual journals. During the implementation of the discovery learning model, students are free to explore a variety of reading sources. [5]

RESEARCH METHODOLOGY

The goal of this research is to describe the profile of reading literacy skills of primary teacher trainees and assess the impact of the discovery learning model on their reading literacy development. The methodology employed in this study is a sequential explanatory design that combines quantitative and qualitative research methods in successive phases. Quantitative methods are applied in the first phase, followed by qualitative methods in the second. The sequential explanatory design starts with the collection and analysis of quantitative data, which then guides the subsequent collection and analysis of qualitative data.

To gather data on the reading literacy of students, quantitative methods such as pre-tests and post-tests are used both before and after the learning intervention. The experimental design applied is a pre-experimental design with a single group, where tests are administered before and after the experiment. This type of study involves manipulative experiments aimed at determining the impact of certain manipulations on the observed behavior of participants. While this pre-experimental design does not meet all the requirements of a true experimental study, it allows for preliminary insights into the effects of the interventions.

ANALYSIS AND RESULTS

International assessments such as PISA, PIRLS, and TIMSS increasingly play a similar role in school system evaluations by monitoring national standards and comparing them with those of other jurisdictions. To secure a spot for Uzbekistan among the top 10 or 20 countries in these international assessments, it is essential to implement consistent reforms in the evaluation process. Introducing new assessments—such as the "Multiplication Table Test," "Phonetic Screening," and entry-level diagnostic tests—will also be necessary.

The pre-experiment setup involves three categories: a single case study, a pre-test with one group, and a post-test experiment. The methodology also includes a randomized controlled trial (RCT). The qualitative research design is descriptive in nature and encompasses tests for measuring students' reading literacy based on their response sheets.

Results of data analysis on students' reading literacy indicators

№	Student Performance Reading Literacy Skills	Average	Category
1	Access and Retrieve	48	low
2	Translate and Integrate	51,8	low
3	Evaluate and Reflect	56,3	low

In elementary science classes, assessing students' minimal reading literacy competencies—particularly regarding basic physics concepts encountered in higher grades—reveals that their reading literacy remains relatively low. According to analysis results, the highest average reading literacy score is observed in the "Evaluation and Reflection" indicator, while the lowest average score corresponds to the "Access and Retrieval" indicator. With this in mind, we now turn our attention to evaluating the effectiveness of implementing the Discovery Learning model.

Results indicate that average scores before and after implementing the Discovery Learning model demonstrate improvement: 54.03 before implementation and 72.21

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afterward. The difference in these scores illustrates the model's effectiveness. Similar studies suggest that such improvements can also be achieved using methods like the "Media Literacy Tree." Discovery Learning has been shown to successfully enhance students' reading literacy skills in the "Elementary School Teacher Education Program" at STKIP Kusuma Negara. [6]

The model's emphasis on finding concepts and then applying them directly to everyday life underscores a hands-on learning experience. By engaging students and learners in an active and positive reading process, Discovery Learning encourages them to investigate teacher-posed problems, discover answers, and express their thoughts and opinions. In this process, learners develop critical thinking skills, and the teacher facilitates the discovery of general concepts or principles based on provided materials and information.

Grounded in 21st-century competencies, reading literacy extends beyond the ability to read and write. It also encompasses cognitive abilities required for academic literacy, fostering both practical and intellectual growth. [7]

The "Pull-Push" diagnostic methodology introduces adjustments to PISA international assessment texts to better align them with the experiences and knowledge of 10-year-old students. For instance, illustrations were added to a single text to aid fourth-grade students in understanding the subject matter, while definitions were included for unfamiliar words in two texts to help fourth- and sixth-grade students. This approach, provisionally named "Pull-Push," highlights two main characteristics:

1. **Similarity in measuring reading literacy between PIRLS and PISA**
2. **A focus on two age groups**—primary and secondary school students.

Developing supplementary questions for each text was the most challenging aspect of preparing materials for the "Pull-Push" technique. The need to create new questions arose for two reasons:

1. **Statistical reliability standards for the texts:** A test should include numerous interesting questions that maintain student engagement. Such variety allows for objective measurements and well-founded conclusions.
2. **Balancing the complexity level of all questions in the set:** This ensures a fair assessment of reading skills across different difficulty levels.

To classify the "Pull-Push" technique, a general reading competency framework common to PIRLS and PISA questions was required. Instead of using PIRLS' four dimensions, the technique opted for PISA's three scales. The reasoning is that PIRLS results are often reprocessed to consolidate reading information explicitly stated in the text and deriving straightforward conclusions into a single scale. Moreover, using a larger set of tasks provides more robust data for statistical analysis. The table accompanying the analysis specifies the number of questions for each reading competency group. [9]

CONCLUSION/RECOMMENDATION

The syntax of the discovery learning model helps teach and foster reading literacy skills at each step. From the perspective of reading and writing, students and learners gain a broad range of knowledge and understanding. Consequently, exploring alternative solutions to the challenges that arise from introducing a variety of reading resources is a wise approach. Consistent implementation of reading plans and habits leads to improved reading practices.

Future research should consider the following points:

1. Establishing clear quantitative evidence on how exams affect students' well-being and mental health. Reliable conclusions should indicate that exams do not cause long-term harm, but distinguish between short-term manageable stress and prolonged detrimental anxiety.
2. Looking beyond average metrics to identify factors that might particularly challenge certain students.
3. Using robust samples and validated measures rather than relying solely on self-reported perceptions.

FINDINGS AND RECOMMENDATIONS

1. The reading literacy skills of elementary students regarding core concepts remain relatively low when based on minimal competency assessments. Analyzing results is crucial for improving their outcomes.
2. The effectiveness of implementing the discovery learning model for enhancing students' reading literacy aligns with moderate benchmarks. Each syntax of the model integrates reading literacy activities at every step, thereby teaching and encouraging literacy skills among students.

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