

Our Ref.: UTM.J.53.01.00/10.14/1  
Date : 19 January 2022

Dr. Khaeruddin  
Universitas Negeri Makassar  
Jl. A. P. Pettarani, Tidung, Kec. Rappocini,  
Kota Makassar, Sulawesi Selatan 90222,  
Indonesia.

**Assalamualaikum warahmatullah wabarakatuh,**

**Dear Dr,**

**INVITATION AS SPEAKER FOR THE 1<sup>st</sup> INTERNATIONAL ONLINE COLLOQUIUM:  
LEARNING SCIENCE AND MATHEMATICS EDUCATION**

With all due respect, we are pleased to inform you that the School of Education, Faculty of Social Science and Humanities in collaboration with Universitas Negeri Makassar Indonesia will be organizing the "1<sup>st</sup> International Online Colloquium: Learning Science and Mathematics Education". This colloquium is a platform for exchanging knowledge, skills, experiences among academics and students between UTM and UNM on their research activities and findings within the science and mathematics education.

2. It is our honour to invite you to give a speech for at the colloquium that will be held on:

**Date: 22<sup>nd</sup> January 2022 (Saturday)**

**Time: 9.35 am – 10.30 am MYT**

**Method: <https://utm.webex.com/meet/ninadiana>**

3. The tentative for the opening ceremony of the colloquium is attached for your reference. We are looking forward to your attendance at this event. Thank you for your kind attention and cooperation.

Sincerely,



**PROF. DR. FATIN ALIAH PHANG**

Chair

School of Education

Faculty of Social Sciences and Humanities

Universiti Teknologi Malaysia

Johor Bahru, Malaysia

**Tentative Schedule of the 1<sup>st</sup> INTERNATIONAL ONLINE COLLOQUIUM:  
LEARNING SCIENCE AND MATHEMATICS EDUCATION**

Link: Webex Platform <https://utm.webex.com/meet/ninadiana>

Time	Agenda
<b>Day 1 (22<sup>nd</sup> January 2022)</b>	
9.00 - 9.10 am	Welcoming Speech by the Host and the recital of Doa'
9.10 - 9.20 am	Welcoming Speech by the Director of Programme (Indonesia), Dr. Muhammad Ammar Naufal
9.20 - 9.30 am	Opening Speech by Drs. Suwardi Annas, Dean Fakultas Matematika and IPA Universitas Negeri Makassar, Indonesia
9:30 am – 9:35 am	Montage of the opening ceremony
9.35 - 10.30 am	<p><b>Slot 1: Advancing Science &amp; Mathematics Education in the 21st Century</b></p> <ol style="list-style-type: none"> <li>1. Speaker : Dr Khaeruddin, Universitas Negeri Makassar</li> <li>2. Speaker : Prof Dr Zaleha Binti Ismail, Universiti Teknologi Malaysia</li> </ol>
11:00 – 12:30 pm	Parallel Session I for Paper Presentation
<b>12:30 – 2:00 pm</b>	<b>Break</b>
2.00 -3.00 pm	<p><b>Slot 2: Shaping the Science &amp; Mathematics Educators through Innovation in Teaching &amp; Learning</b></p> <ol style="list-style-type: none"> <li>1. Speaker : Assoc. Prof. Dr. Muhammad Anwar, Universitas Negeri Makassar</li> <li>2. Speakers : Assoc. Prof. Dr. Johari Surif &amp; Dr Nor Hasniza Ibrahim, Universiti Teknologi Malaysia</li> </ol>
3.00 - 4.30 pm	Parallel Session II for Paper Presentation
<b>DAY 2 (23<sup>rd</sup> January 2022)</b>	
9.00 – 10.00 am	<p><b>Slot 3: Tapping Constructivist Theory in Science and Mathematics Learning</b></p> <ol style="list-style-type: none"> <li>1. Speaker : Dr Nurwati Djam'an, Universitas Negeri Makassar</li> <li>2. Speakers : Dr Noorzana Khamis &amp; Dr Nina Diana Nawi, Universiti Teknologi Malaysia</li> </ol>
10:00 – 12:00 pm	Parallel Session III for Paper Presentation
12.10-12.20 pm	Closing Speech by the Director of Programme (Malaysia), Mr. Muhammad Farihin bin Azlin
12.20-12.30 pm	Closing Speech by Prof Dr. Fatin Aliah Phang. Chair, School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia. Closing and photo session.



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA



# CERTIFICATE

INTERNATIONAL 1st ONLINE COLLOQUIUM  
ON LEARNING SCIENCES AND MATHEMATICS EDUCATION

This Certificate is Proudly Awarded to:

**DR KHAERUDDIN**

For Being the Invited Speaker on 22nd & 23rd Jan 2022

*Prof. Ts Dr. Zaidatun Tasir*

DEAN

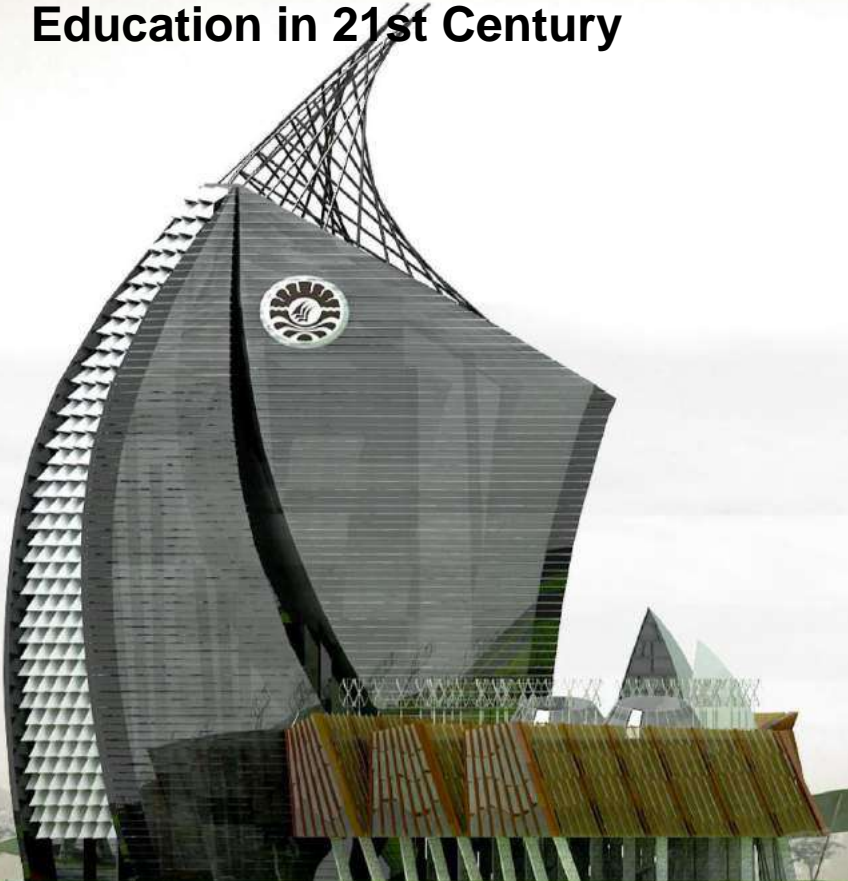
Faculty of Social Sciences and Humanities  
Universiti Teknologi Malaysia

*DRS. Suwardi Annas M.SI. PH.D*

DEAN

Fakultas Matematika IPA Universitas Negeri  
Makassar Indonesia

**Advancing Science & Mathematics  
Education in 21st Century**



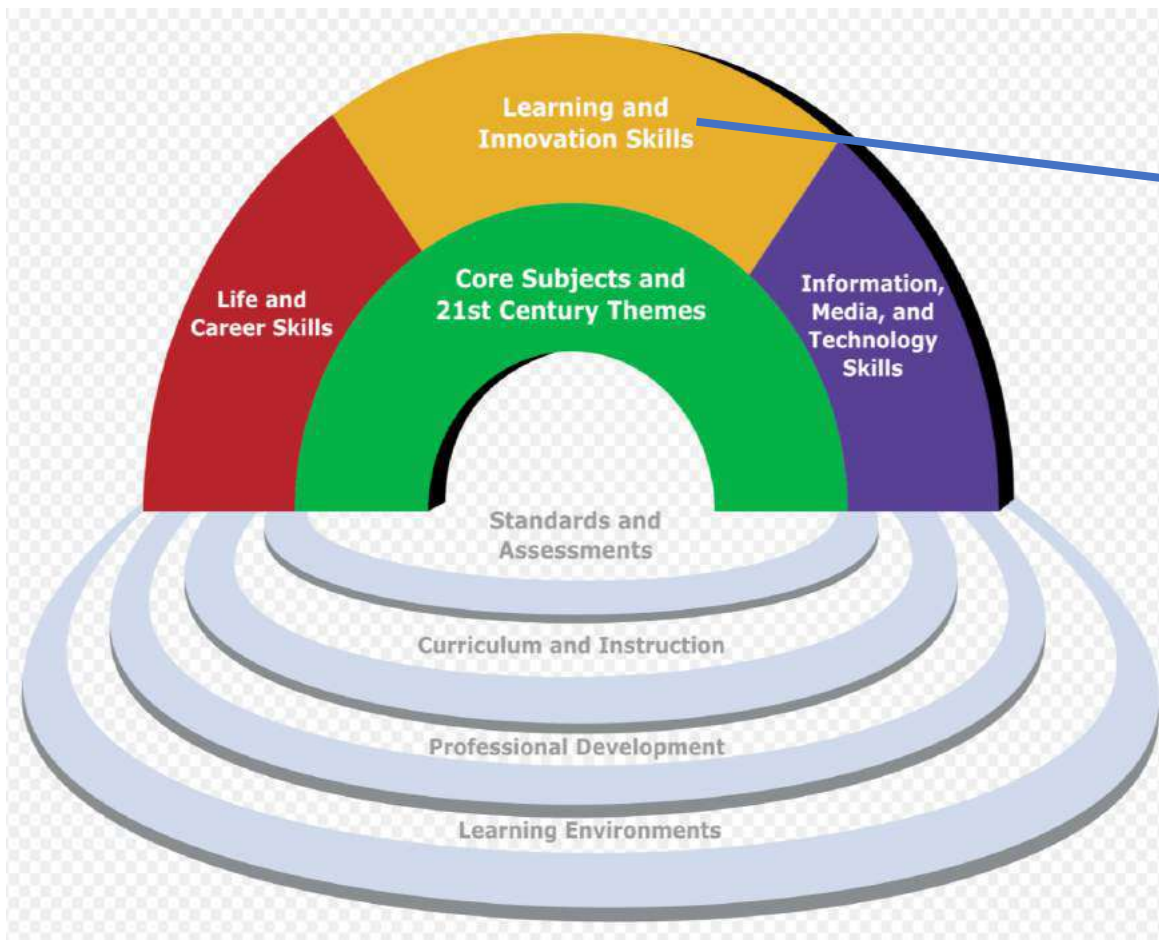
**Kampus  
Merdeka**  
INDONESIA JAYA

# **HIGHER ORDER THINKING SKILLS OF STUDENTS THROUGH SCIENCE SUBJECTS**

**Team**

**Khaeruddin, Sukmawati, Siti  
Indarwati, Hasriana, Fadilah Afifah**

## Framework 21st century skills



### **Learning and innovation skills:**

Critical Thinking and Problem Solving, communications and collaboration, Creativity and Innovation

# Table of Thinking

Krulik & Rudnick	Bloom Orisinil	Bloom Revisi	Presseisen "HOTS"
<i>recall</i>	Knowledge	Remember	
<i>basic</i>	Understanding	Understand	
	Application	Apply	
<i>critical</i>	Analysis	Analyze	Critical thinking; Creative thinking; problem solving; Decision making
<i>creative</i>	Synthesis	Evaluate	
	Evaluation	Create	

## BACKGROUND

- The results of the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Survey (TIMSS) surveys, since their participation in 1999 the ranking of Indonesian students has not been able to occupy the top position.
- TIMSS and PISA show that the majority of students in Indonesia are still at the Lower Order Thinking Skills (LOTS) level.



- The formulation of indicators, objectives, learning activities, and their assessment in the learning design that is made and the implementation of the learning process, the teacher must be able to develop and then convert learning from LOTS to HOTS, and this must have been started since designing the Learning Implementation Plan

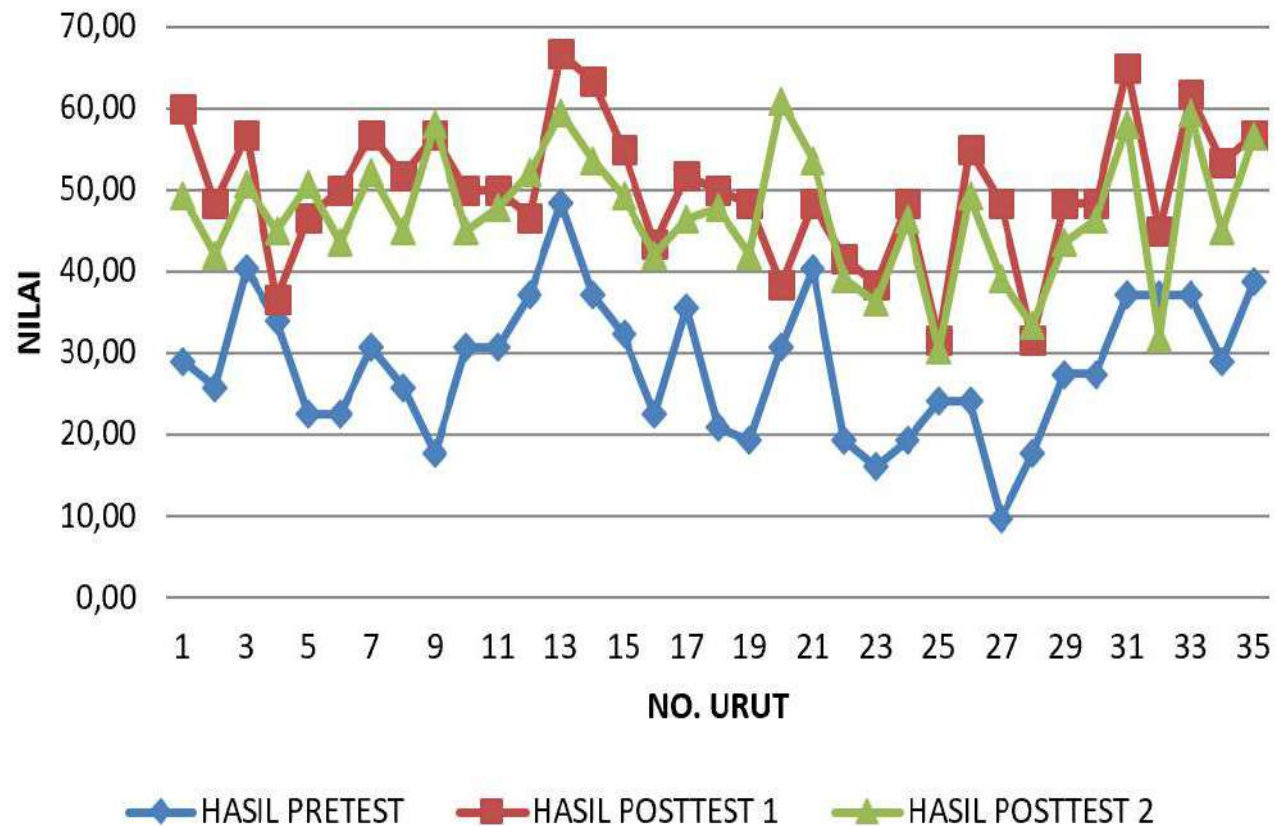
## *Higher Order Thinking Skills (HOTS)*



HOTS is a thinking process that is not just memorizing and relaying known information, but higher order thinking skills are abilities that connect, manipulate, and transform knowledge and experience

already possessed to think critically and creatively in an effort to make decisions and solve problems in new situations (Resnick, 1987; Bloom (Ariyana, A., Pudjiastuti, A, Bestary, R, Zamroni, 2018); John Dewey (Sani, 2019))

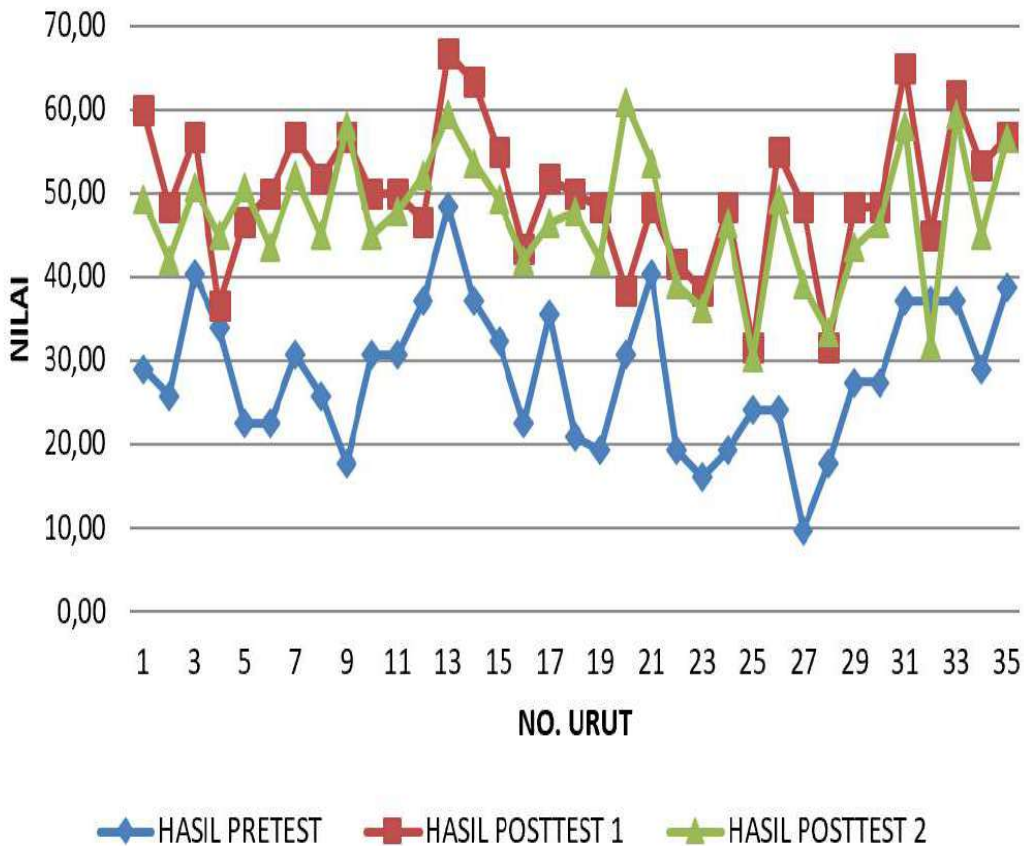




## Research result

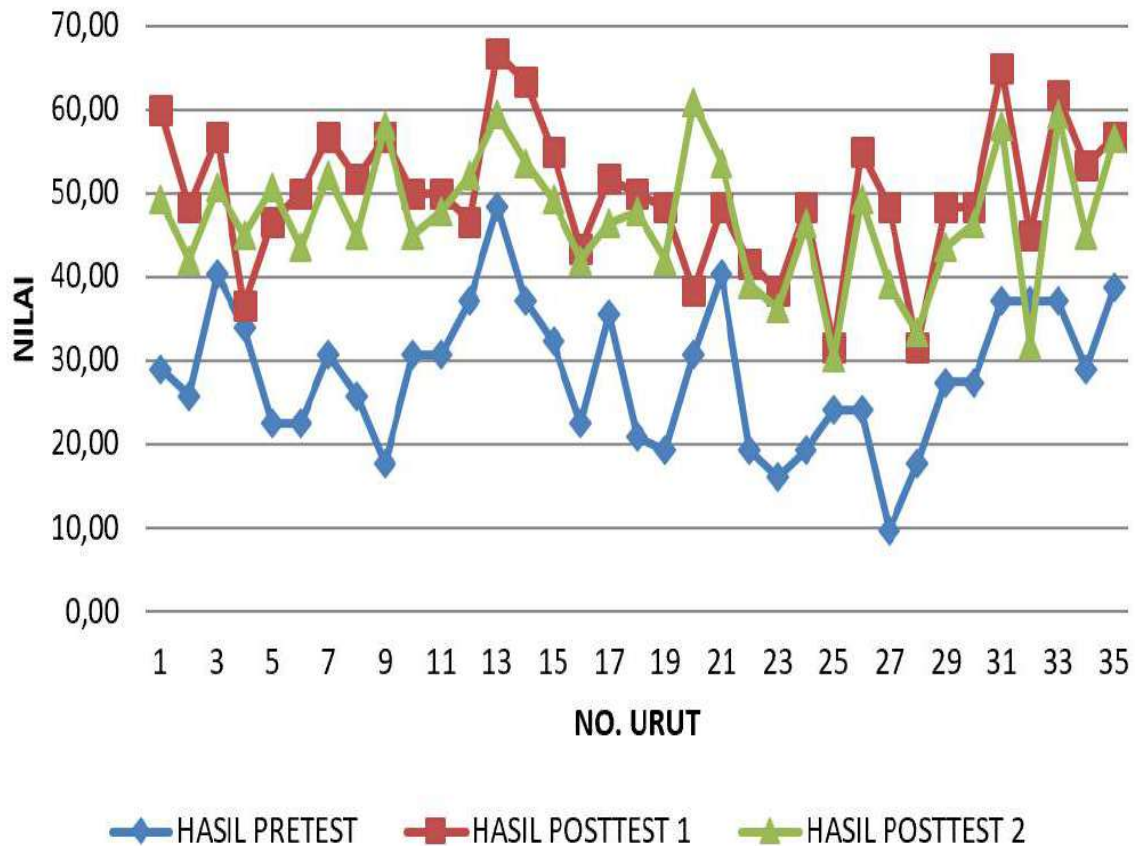
The graph beside shows that there was an increase in test scores from the pretest, posttest Phase 1 and Posttest Phase 2. This shows that the project-based learning model contributes to increasing the HOTS of students at **Junior High School (SMPN) 33 Makassar**

## Discussion



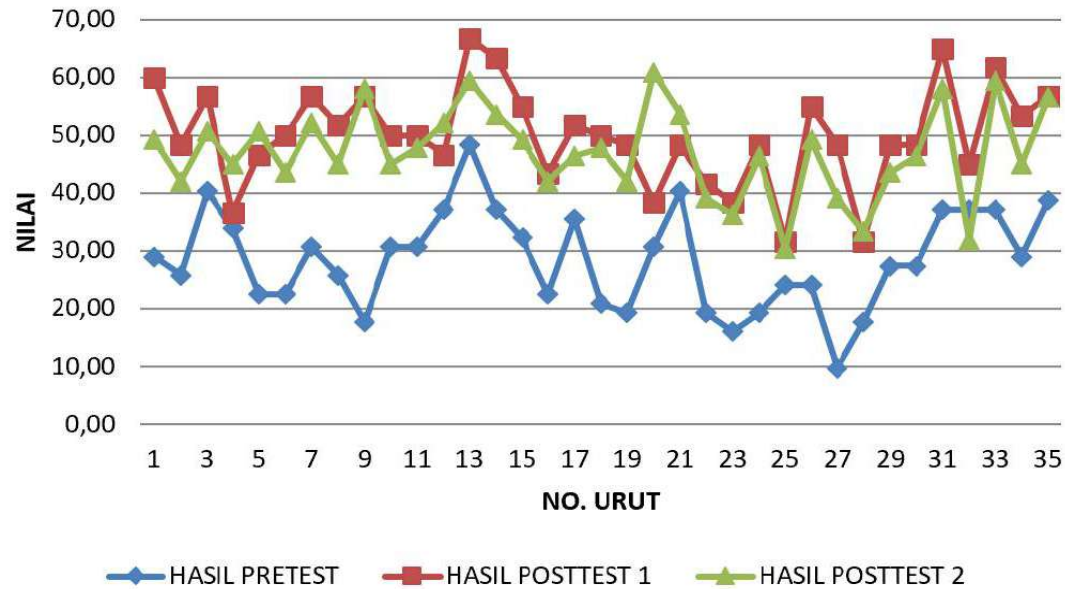
- All students received the same pretest before the influence/intervention of the project learning model. The data from the pretest results obtained by students getting the lowest score of 9.68, while the highest score was 48.39 with an average score of 28.53 from the ideal value of 100. This shows that the higher order thinking ability of students is still very low.
- This means that students' complex thinking skills in describing material, making conclusions, building representations, analyzing, and building relationships involving the most basic mental activities are still low.
- Whereas the 2013 curriculum is directed to equip participants to improve HOTS, because HOTS can encourage students to think broadly and deeply about the subject matter

## Discussion



- This result is in line with the results of the international study Program for International Student Assessment (PISA) which shows that the achievement of reading literacy, mathematical literacy, and scientific literacy achieved by Indonesian students is very low.
- Generally, the ability of Indonesian students is very low in: (1) integrating information; (2) generalizing case by case into a general solution; (3) formulating real-world problems into subject concepts; and (4) conduct an investigation

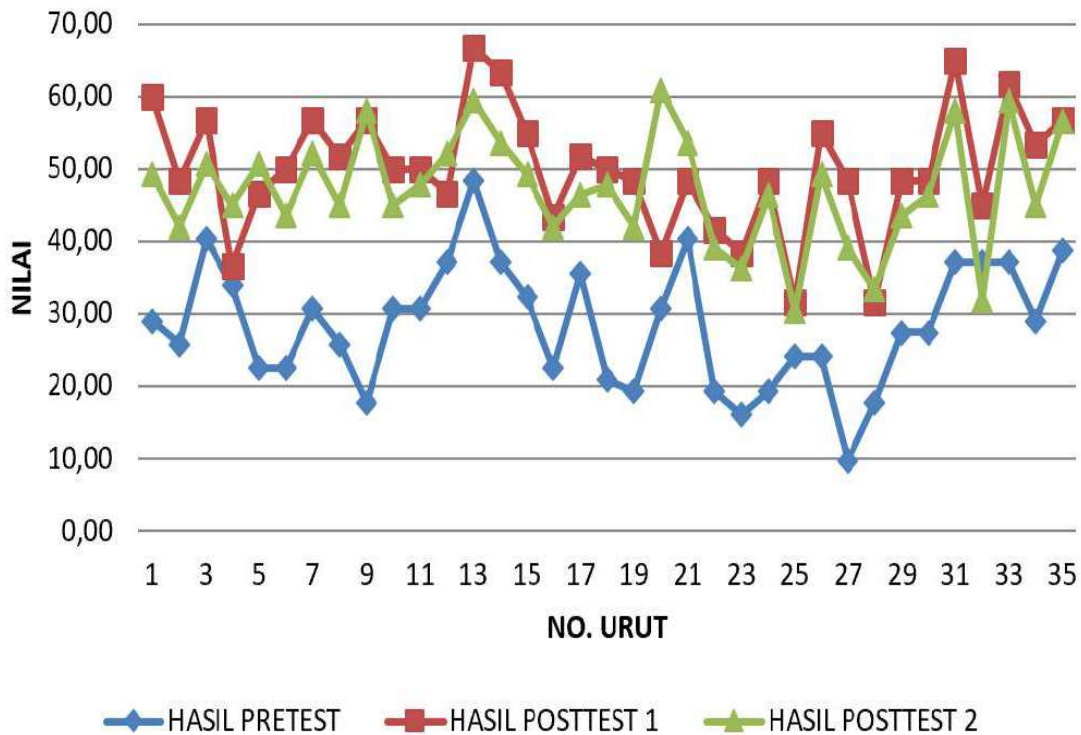
## Discussion



- The low results of the HOTS test at SMPN 33 Makassar are caused by the fact that students are not accustomed to working on HOTS questions as an instrument that can measure students' higher-order thinking skills, namely thinking skills that are not just remembering, understanding, or applying (apply).
- HOTS questions in the context of an assessment measure skills 1) transfer one concept to another, 2) process and integrate information, 3) find links from different types of information, 4) use information to solve problems (problem solving), and 5) critically examine ideas and information.
- Students are only used to working on routine cognitive questions

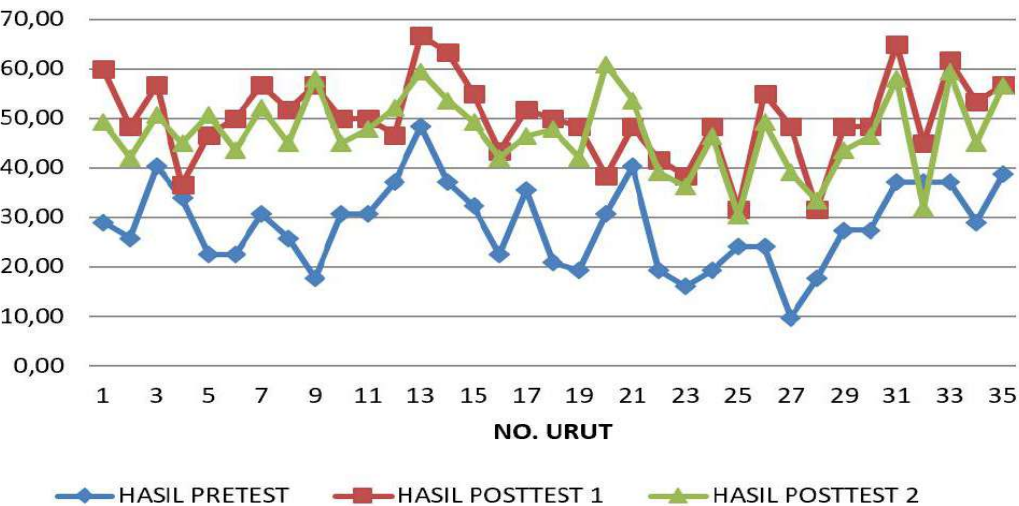
This statement is evidenced by the results of a review of items carried out by the Directorate of High School Guidance for USBN Assistance for the 2018/2019 academic year on 26 subjects at 136 Referral High Schools spread across 34 Provinces, showing that of the 1,779 items analyzed, most of them are at Level-1. and Level-2. Of the 136 Referral High Schools, only 27 schools compiled HOTS questions as much as 20% of all USBN questions were made, 84 schools compiled HOTS questions below 20%, and 25 schools stated that they did not know whether the HOTS questions were prepared or not. This is not in accordance with the demands of the 2013 Curriculum assessment which further improves the implementation of HOTS assessment models

## Discussion



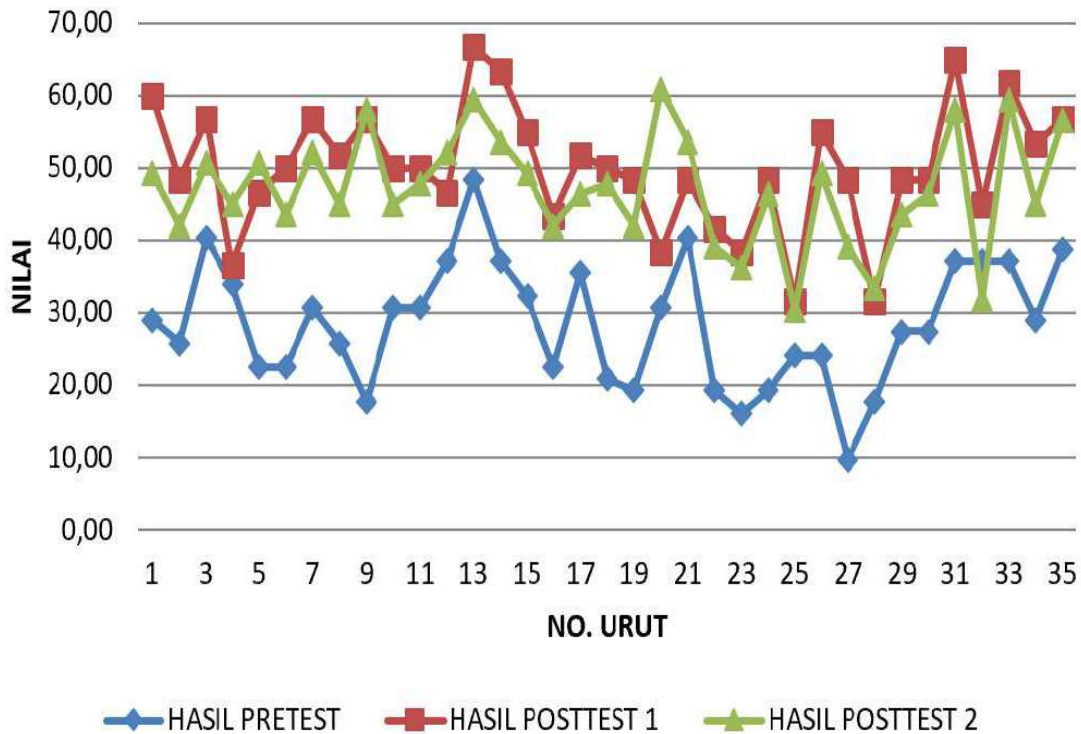
- Learning is oriented to higher order thinking skills or HOTS, the role of the teacher does not explain much, on the contrary, the teacher stimulates a lot of questions to encourage students' original thoughts to emerge. This statement is in line with the results of the second test as posttest stage 1, there are students who get the lowest score of 31.67, while the highest is 66.67 with an average score of 49.95 from the ideal value of 100. This result is not far off. different from the results of the posttest Stage 2, namely students who got the lowest score of 30.43 and the highest score of 60.87 with an average score of 47.05.
- This shows that the higher order thinking ability of students has increased when compared to the results of the pretest although it is still relatively low

## Discussion

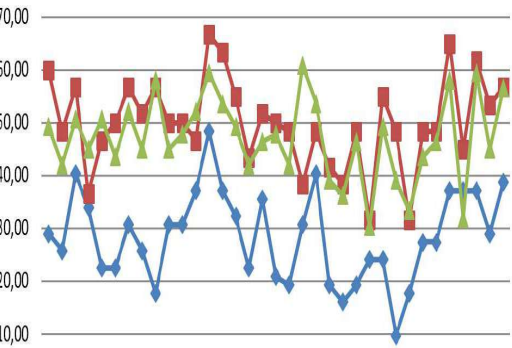


- This increase was due to the fact that the teacher had stimulated a lot of questions to encourage students' original thoughts to emerge through the project learning model with the small group discussion method for eight meetings.
- Students are divided into several small groups consisting of 4-5 children in each group. After explaining the purpose of the discussion, the steps, and an outline of the things being discussed, each group was asked to solve a problem in the **Student Worksheet (LKPD)** that had been prepared by the teacher.
- LKPD compiled by HOTS-oriented teachers. The results of group discussions are presented in a panel or class forum, where each group conveys the results of their discussion to other groups to be discussed together in a class forum, for 20 minutes then followed by questions and answers in the discussion.
- The results of the discussion and the content of the lesson are discussed and summarized by the students

## Discussion



- This is in accordance with John Dewey's statement, where project-based learning allows students to make various choices in the learning process.
- Students work together on a variety of different project-related tasks, because project-based learning is meaningful, integrated, and active, teachers find more opportunities to challenge students at their own level of ability.
- Learners become experienced in doing project work, and challenge themselves to each other to ask more questions, find more learning resources, and create more informative projects



## Conclusion

The project-based learning model contributes to increasing the HOTS of students at SMPN 33 Makassar.



## Suggestion

1. Teachers develop innovative learning tools for all school levels by referring to learning packages that have been developed by developed countries in order to improve HOTS.
2. The teacher compiles and develops HOTS questions on an ongoing basis and is implemented continuously.





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