



1 of 1

[Download](#) [Print](#) [Save to PDF](#) [Save to list](#) [More...](#)

**Journal of Physics: Conference Series** • [Open Access](#) • Volume 1366, Issue 1 • 7 November 2019 • Article number 012082 • 2nd International Conference on Applied and Industrial Mathematics and Statistics 2019, ICoAIMS 2019 • Kuantan, Pahang • 23 July 2019 through 25 July 2019 • Code 155273

**Document type**Conference Paper • [Bronze Open Access](#) • [Green Open Access](#)**Source type**

Conference Proceedings

**ISSN**

17426588

**DOI**

10.1088/1742-6596/1366/1/012082

[View more](#)

# The mathematics education department students' ability in mathematical literacy for uncertainty problems on PISA adaptation test

[Sanjaya, Febi](#) ; [Dewa Putu W.P.](#); [Julie, Hongki](#); [Anggoro, Ant. Yudhi](#); [Rudhito, M. Andy](#)
[Save all to author list](#)<sup>a</sup> Mathematics Education Department, Sanata Dharma University, Yogyakarta, Paingan, Maguwoharjo, Sleman, Indonesia

26

Views count

[View all metrics](#)
[View PDF](#) [Full text options](#) [Export](#)
**Abstract**

Indexed keywords

Sustainable Development Goals 2022

SciVal Topics

Metrics

Funding details

**Abstract**

The Programme for International Student Assessment ( PISA ) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students who are nearing the end of their compulsory education. In most of the PISA-related studies, more students as subjects than teachers . Even mathematics education students who are prospective teachers have not got a place in this PISA research. One of goals of this research was to describe mathematics education students' ability on PISA adaptation test . In this research, there were several steps to achieve the goal, that is (1) creating test questions by adapting PISA test , (2) validating test questions using expert validation, (3) asking the students to do the test , and (4) describing the students' solution test . The mathematics PISA adaptation test consist of 4 scopes, that is quantity, space and shape, change and relationship, and uncertainty. The test contained 13 questions, three quantity problems , three uncertainty problems , three change and relationship problems , and four space and shape problems . This research used 7 students of Mathematics Education Department of Sanata Dharma University as subject

Cited by 0 documents

 Inform me when this document is cited in Scopus:
 

Set citation alert >

**Related documents**

The teachers' mathematics literacy ability for solving uncertainty problems on a PISA adaptation test

 Sanjaya, F. , Anggoro, A.Y. , Julie, H. (2018) *Journal of Physics: Conference Series*

The teacher's mathematical literacy for the change and relationship problems on the PISA adaptation test

 Anggoro, A.Y. , Julie, H. , Sanjaya, F. (2018) *Journal of Physics: Conference Series*

The mathematics education department students' ability in mathematical literacy for the change and relationship problems on the PISA adaptation test




 Anggoro, A.Y. , Julie, H. , Sanjaya, F. (2019) *Journal of Physics: Conference Series*

View all related documents based on references

Find more related documents in Scopus based on:

[Authors](#) > [Keywords](#) >




research. This research was a design research which developed by Cobb and Koeno. In the uncertainty area, all students answer correctly at the level 1 problem, six students answer correctly at the level 4 problem, two students answer correctly at the level 5 problem, two students answer correctly at the level 5 second problem, one student answers correctly at the level 6 problem. Therefore, the quality of mathematics education students' needs to be improved to reach the maximum level in PISA. © Published under licence by IOP Publishing Ltd.

Indexed keywords	▼
Sustainable Development Goals 2022  	▼
SciVal Topics 	▼
Metrics	▼
Funding details	▼

References (11)

View in search results format >

☐ All

RIS export ▼  Print  E-mail  Save to PDF Create bibliography

☐ 1

Campbell, P.F., Nishio, M., Smith, T.M., Clark, L.M., Conant, D.L., Rust, A.H., DePiper, J.N., (...), Choi, Y.

The relationship between teachers' mathematical content and pedagogical knowledge, teachers' perceptions, and student achievement

(2014) *Journal for Research in Mathematics Education*, 45 (4), pp. 419-459. Cited 84 times.

<http://www.nctm.org/publications/archive.aspx?jrn=jrme>

doi: 10.5951/jresmetheduc.45.4.0419

View at Publisher

☐ 2

Julie, H.

(2017) *International Journal of Science and Applied Science: Conference Series*, 1, p. 55. Cited 7 times.

☐ 3

Julie, H., Marpaung, Y.

(2012) *Widya Dharma*, p. 23. Cited 3 times.

☐ 4

Oecd

(2012) *Assessment Framework. Key Competencies in Reading, Mathematics and Science*. Cited 492 times.

☐ 5

Oecd

(2013) *PISA 2012 Results: What Students Know and Can Do. Student Performance in Mathematics, Reading, and Science*. Cited 1792 times.

☐ 6

Ojose, B.

(2011) *Journal of Mathematics Education*, 4, p. 89. Cited 89 times.

- 7 Christiansen, I.B.  
(2006) *Pythagoras*, 64, p. 6. Cited 22 times.
- 
- 8 Stacey, K.  
The PISA view of mathematical literacy in Indonesia ([Open Access](#))  
  
(2011) *Journal on Mathematics Education*, 2 (2), pp. 95-126. Cited 110 times.  
<https://ejournal.unsri.ac.id/index.php/jme/article/view/746/200>  
doi: 10.22342/jme.2.2.746.95-126  
  
View at Publisher
- 
- 9 Lai, Y., Smith, W.M., Wakefield, N.P., Miller, E.R., Goar, J.S., Groothuis, C.M., Wells, K.M.  
Characterizing Mathematics Graduate Student Teaching Assistants' Opportunities to Learn from Teaching  
  
(2016) *Association for Women in Mathematics Series*, 7, pp. 73-88.  
[springer.com/series/13764](https://www.springer.com/series/13764)  
doi: 10.1007/978-3-319-44950-0\_6  
  
View at Publisher
- 
- 10 Julie, H., Sanjaya, F., Anggoro, A.Y.  
The students' ability in the mathematical literacy for uncertainty problems on the PISA adaptation test ([Open Access](#))  
  
(2017) *AIP Conference Proceedings*, 1868, art. no. 050026. Cited 5 times.  
<http://scitation.aip.org/content/aip/proceeding/aipcp>  
ISBN: 978-073541548-5  
doi: 10.1063/1.4995153  
  
View at Publisher
- 
- 11 van den Akker, J., Gravemeijer, K., McKenney, S., Nieveen, N.  
Educational Design Research  
  
(2006) *Educational Design Research*, pp. 1-164. Cited 443 times.  
<https://doi.org/10.4324/9780203088364>  
ISBN: 978-113415565-1; 978-020308836-4  
doi: 10.4324/9780203088364  
  
View at Publisher
- 

© Copyright 2019 Elsevier B.V., All rights reserved.

---

## About Scopus

- What is Scopus
- Content coverage
- Scopus blog
- Scopus API
- Privacy matters

## Language

- 日本語版を表示する
- 查看简体中文版本
- 查看繁體中文版本
- Просмотр версии на русском языке

## Customer Service

- Help
- Tutorials
- Contact us

---

## ELSEVIER

[Terms and conditions ↗](#) [Privacy policy ↗](#)

Copyright © Elsevier B.V ↗. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.  
We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies ↗.





# Journal of Physics: Conference Series

**COUNTRY**[United Kingdom](#)Universities and  
research institutions  
in United KingdomMedia Ranking in  
United Kingdom**SUBJECT AREA AND  
CATEGORY**[Physics and Astronomy](#)  
[Physics and](#)  
[Astronomy](#)  
[\(miscellaneous\)](#)**PUBLISHER**[IOP Publishing Ltd.](#)**H-INDEX****85****PUBLICATION TYPE**Conferences and  
Proceedings**ISSN**

17426588, 17426596

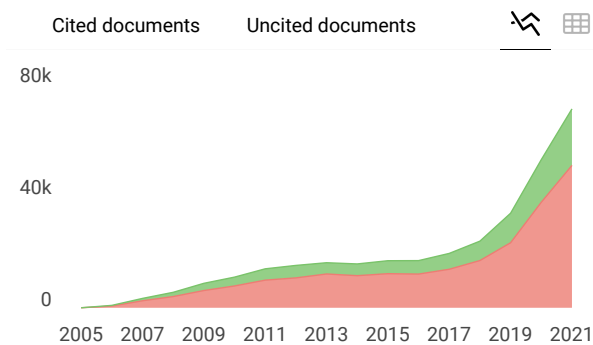
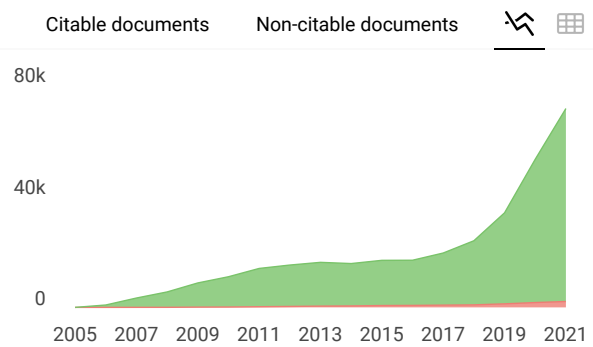
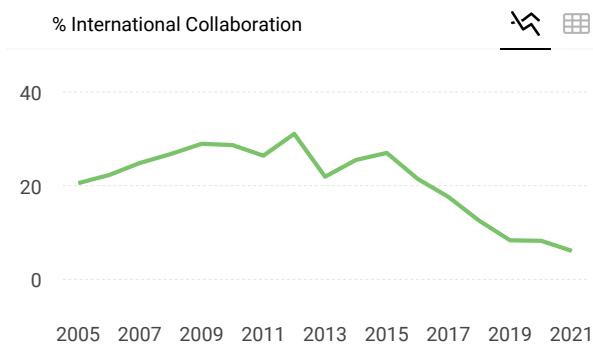
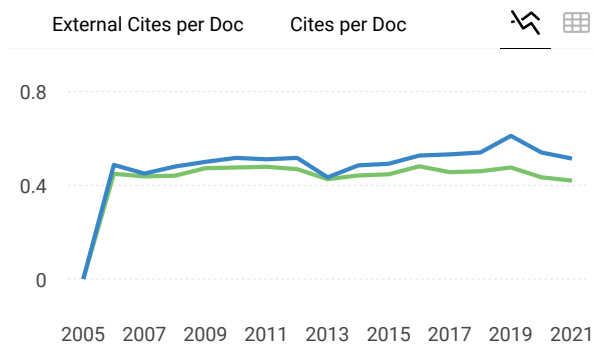
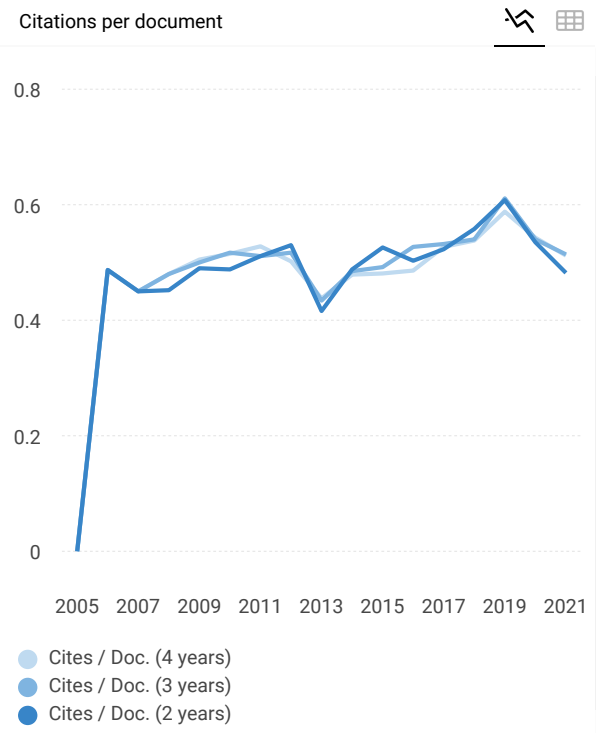
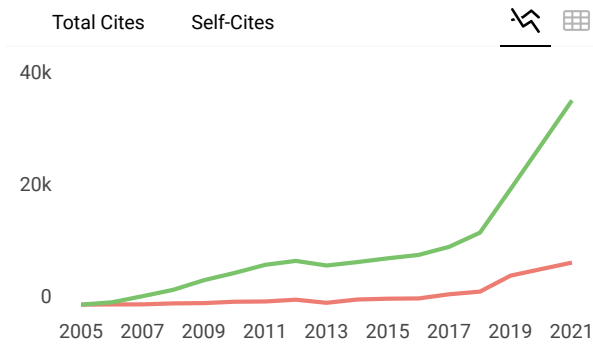
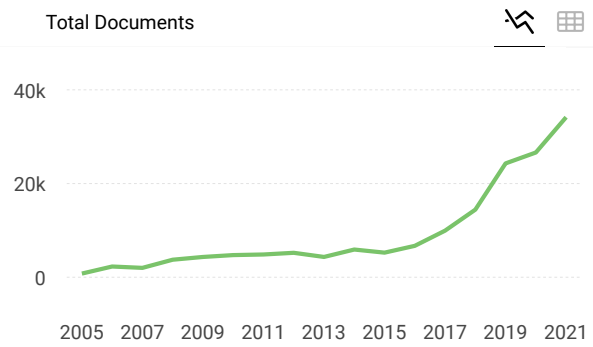
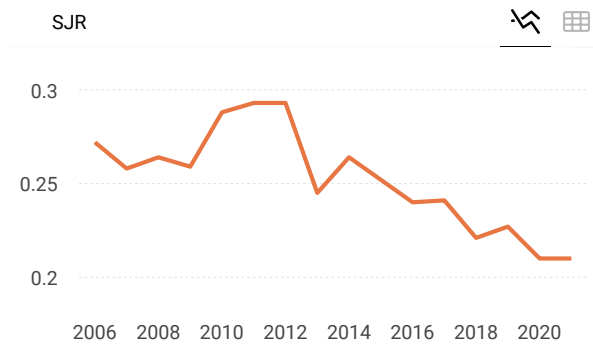
**COVERAGE**

2005-2021

**INFORMATION**[Homepage](#)[How to publish in this  
journal](#)[jpcs@ioppublishing.org](mailto:jpcs@ioppublishing.org)**SCOPE**

The open access Journal of Physics: Conference Series (JPCS) provides a fast, versatile and cost-effective proceedings publication service.

[Join the conversation about this journal](#)[Quartiles](#)



**Journal of Physics: Conference Series**

Not yet assigned quartile

**SJR 2021**  
0.21

powered by scimagojr.com

← Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimaç
```

ISSN 1742-6596

# Journal of Physics

## Conference Series

The 11th Biennial Conference on  
Classical and Quantum Relativistic  
Dynamics of Particles and Fields

# 1239

VOLUME 1239 – 2010

4–7 June 2009  
Mérida, Yucatán, Mexico

**EDITOR**  
Martin Land

The open access journal for conference proceedings

[iopscience.org/jpcs](http://iopscience.org/jpcs)

**IOP** Publishing

## Organising Committee

**Chairman:**

Associate Professor Dr. Mohd Zuki Salleh

**Co-Chairman:**

Dr. Zulkhibri Ismail

**Secretary**

Dr Norhayati Rosli

**Treasurer:**

Dr. Muhammad Azrin Ahmad

Dr. Nor Aida Zuraimi Md Noar

**Sponsorship:**

Miss Rozieana Khairuddin

Dr. Zulkhibri Ismail

Miss Nur Zahirah Md Noor

**Logistic:**

Mrs Ezrinda Mohd Zaihidee

Dr. Yuhani Yusof

Mr Muhammad Halim Paboh

**Keynote/Invited Speaker:**

Dr. Noryanti Muhammad

**Program Book:**

Dr. Norhafizah Md Sarif

Mrs Najihah Mohamed

**Proceedings & Journals Publication:**

Dr. Norazaliza Mohd Jamil

Dr. Anvarjon Ahmedov Ahat Jonovich

Dr. Nor Izzati Jaini

Dr. Abdul Rahman Mohd Kasim

Mrs Siti Fatimah Ahmad Zabidi

Mrs Rahimah Jusoh @ Awang

**Registration & Souvenirs:**

Miss Nurfatimah Mohamad Hanafi

Mrs Intan Sabariah Sabri

**Protocol:**

Ts. Dr. Azlyna Senawi

Dr Siti Roslindar Binti Yaziz

**Publicity & Website:**

Dr. Nor Alisa Mohd Damanhuri

Miss Laila Amera Aziz



### Scientific Committee

Assoc. Prof. Dr. Dumitru Vieru, *Gheorghe Asachi Technical University of Iasi, Romania*

Emeritus Prof. Constantin Fetecau, *Gheorghe Asachi Technical University of Iasi, Romania*

Prof. Frank Coolen, *University of Durham, UK*

Prof. Qi Wang, *University of South Carolina, US*

Prof. Xuerong Mao, *University of Strathclyde, United Kingdom*

Prof. Dr. Ioan Pop, *Babeş-Bolyai University*

Dr. John Boland, *University of South Australia, Australia*

Emeritus Prof. Phil Howlett, *University of South Australia, Australia*

Prof. Serikbayev Abdukarim, *National Algaian University, Kazakhstan*

Dr Sergey Utyuzhnikov, *University of Manchester, United Kingdom*

Prof. Dr. Basuki Widodo, *Sepuluh Nopember Institute of Technology, Indonesia*

Assoc. Prof. Dr. Heri Kuswanto, *Sepuluh Nopember Institute of Technology, Indonesia*

Dr. Imam Mukhlash, *Sepuluh Nopember Institute of Technology, Indonesia*

Dr. Suhartono, *Sepuluh Nopember Institute of Technology, Indonesia*

Prof. Dr. Shaharuddin Salleh, *Universiti Teknologi Malaysia*

Prof. Dr. Muhammad Hisyam Lee, *Universiti Teknologi Malaysia*

Dr. Yeak Su Hoe, *Universiti Teknologi Malaysia*

Prof. Maslina Darus, *Universiti Kebangsaan Malaysia*

Prof Dr Kamarulzaman Ibrahim, *Universiti Kebangsaan Malaysia*

Assoc. Prof. Dr. Maznah Mat Kasim, *Universiti Utara Malaysia*

Assoc. Prof. Dr. Mohd Kamal Mohamad Nawawi, *Universiti Utara Malaysia*

Assoc. Prof. Dr. Mohd Rashid Ab Hamid, *Universiti Malaysia Pahang*

Assoc. Prof. Dr. Anvarjon Ahmedov Ahatjonovich , *Universiti Malaysia Pahang*

Dr. Abdul Rahman Mohd Kasim, *Universiti Malaysia Pahang*

Dr. Roslinazairimah Zakaria, *Universiti Malaysia Pahang*

Dr. Nor Aida Zuraimi Md Noar, *Universiti Malaysia Pahang*

Dr. Mohd Sham Mohamad, *Universiti Malaysia Pahang*

### Keynote Speakers

- Dato' Sri. Dr. Mohd Uzir Mahidin  
*Chief Statistician, Department of Statistics Malaysia*
- Emeritus Prof. Dr. Ioan Pop  
*Faculty of Mathematics and Computer Science, University of Babes-Bolyai, Romania*
- Prof Kalmenov Tynysbek Sharipovich  
*National Academy of Sciences, Republic of Kazakhstan*
- Prof Dr. Mohd Isa Irawan  
*Faculty of Mathematics Computing and Data Science (FMKSD), Institut Teknologi Sepuluh Nopember Surabaya, Indonesia*
- Dr Dzaharudin Mansor  
*National Technology Officer, Microsoft Malaysia*
- Dr Suhartono  
*Department of Statistics, Institut Teknologi Sepuluh Nopember (ITS) Surabaya, Indonesia*

# Table of contents

Volume 1366

2019

◀ Previous issue      Next issue ▶

**2nd International Conference on Applied & Industrial Mathematics and Statistics 23–25 July 2019, Kuantan, Pahang, Malaysia**

Accepted papers received: 08 October 2019

Published online: 07 November 2019

Open all abstracts

## Preface

<b>OPEN ACCESS</b>	011001
Preface/Introduction	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	011002
Peer review statement	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>

## Papers

### Applied Mathematics

<b>OPEN ACCESS</b>	012001
Substitution Box Design Based from Symmetric Group Composition	
Muhammad Fahim Bin Roslan, Kamaruzzaman Seman, Azni Haslizan Ab Halim and M Nor Azizi Syam Mohd Sayuti	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	012002
Stagnation-Point Flow and Heat Transfer Over an Exponentially Stretching/Shrinking Sheet in Hybrid Nanofluid with Slip Velocity Effect: Stability Analysis	
N S Anuar, N Bachok, N M Arifin, H Rosali and I Pop	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	012003
Numerical Study of Mixed Convection Heat Transfer in Methanol based Micropolar Nanofluid about a Horizontal Circular Cylinder	
M Z Swalmeh, H T Alkasasbeh, A Hussanan and M Mamat	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	012004
Malaysia's 14th General Election via Twitter: An analysis using the epidemiological model	
N S M Noor, K A K Akil and L A Shafie	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	012005
Natural convection flow of Sodium Alginate based Casson nanofluid about a solid sphere in the presence of a magnetic field with constant surface heat flux	
Firas A Alwawi, Hamzeh T Alkasasbeh, Ahmad M Rashad and Ruwaidiah Idris	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>
<b>OPEN ACCESS</b>	012006
Relative equilibria in curved restricted 4-and 5-body problems	
Sawsan Alhawaity and Muhammad Shoaib	
<a href="#">+ Open abstract</a>	<a href="#">View article</a> <a href="#">PDF</a>



<b>OPEN ACCESS</b>	012007
Williamson fluid flow over a stretching sheet with varied wall thickness and slip effects	
Shazwani Md Razi, Siti Khuzaimah Soid, Ahmad Sukri Abd Aziz, Noorashikin Adli and Zailaha Md Ali	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012008
MHD Flow and Heat Transfer of Ferrofluid on Stagnation Point along Flat Plate with Convective Boundary Condition and Thermal Radiation Effect	
S H M Yasin, M K A Mohamed, Z Ismail, B Widodo and M Z Salleh	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012009
Pseudospectral method with linear damping effect and de-aliasing technique in solving nonlinear PDEs	
Azwani Alias, Nik Nur Amiza Nik Ismail and Fatimah Noor Harun	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012010
Mathematical models of heterogeneity in cancer cell growth: a review	
Priscilla S. Macansantos	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012011
Thermal Radiation Effect on MHD Stagnation Point flow of Williamson Fluid over a stretching Surface	
Hasmawani Hashim, Muhammad Khairul Anuar Mohamed, Nazila Ishak, Norhafizah Md Sarif and Mohd Zuki Salleh	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012012
Numerical Solutions of MHD Stagnation-Point Flow over an Exponentially Stretching/Shrinking Sheet in a Nanofluid	
A N H Rahman, N Bachok and H Rosali	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012013
MHD stagnation point flow towards a quadratically stretching/shrinking surface	
N.A.A.M. Nasir, A. Ishak, I. Pop and N. Zainuddin	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012014
MHD boundary layer flow over a permeable flat plate in a ferrofluid with thermal radiation effect	
Muhammad Khairul Anuar Mohamed, Farah Nadia Abas and Mohd Zuki Salleh	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012015
MHD Stagnation Point Flow of Micropolar Nanofluid with Soret and Dufour Effects	
Siti Norfatimah Binti Zulkifli, Norhafizah Md Sarif, Mohd Zuki Salleh and Ezzatul Farhain Azmi	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012016
Good basis vs bad basis: On the ability of Babai's Round-off Method for solving the Closest Vector Problem	
A Mandangan, H Kamarulhaili and M A Asbullah	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012017
Mathematical Modelling and Simulation of the Performance of PV/T Air Solar Collector	
Noran Nur Wahida Khalili, Mahmod Othman, Mohd Nazari Abu Bakar, Hamzah Sakidin and Mohd Lazim Abdullah	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>OPEN ACCESS</b>	012018
Mathematical Modeling of Cancer Growth Process: A Review	



OPEN ACCESS	012075
A Bootstrap Simulation for comparison of Group Risk Plan and Multi-Peril Crop Insurance Policy	
Valantino Agus Sutomo, Dian Kusumaningrum, Rahma Anisa and Aryana Paramita	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012076
Fuzzy Analytic Hierarchy Process using Intuitive Vectorial Centroid for Eco-friendly Car Selection	
Adam Shariff Adli Aminuddin, Ku Muhammad Na'im Ku Khalif, Fadhilah Che Jamil and Nor Izzati Jaini	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012077
A Preliminary Study of Optimizing Back Pain Medicinal Cupping Points Disease via Graph Colouring	
Nurfatihah Mohamad Hanafi, Yuhani Yusof, Mohd Sham Mohamad, Muhamad Faiz Abu Bakar and Mohd Adhha Ibrahim	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012078
A Comparison of Simulated Annealing Cooling Strategies for Redesigning a Warehouse Network Problem	
Rozieana Khairuddin and Zaitul Marlizawati Zainuddin	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012079
A Hybrid of Quasi-Newton Method with CG Method for Unconstrained Optimization	
N 'Aini, M Mamat, M Rivaie and I M Sulaiman	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>Mathematics Education</b>	
OPEN ACCESS	012080
Calculus video recommender system	
Noor Latiffah Adam, Muhamad Syahmil Aiman Sulaiman and Shaharuddin Cik Soh	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012081
Online learning environment to enhance HOTS in mathematics using Polya's problem solving model	
Sudirman Mustapha, Mohd Shafie Rosli and Nor Shela Saleh	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012082
The mathematics education department students' ability in mathematical literacy for uncertainty problems on PISA adaptation test	
Febi Sanjaya, W.P. Dewa Putu, Hongki Julie, Ant. Yudhi Anggoro and M. Andy Rudhito	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012083
Pre-Service Mathematics Teachers' Knowledge about Higher-Order Thinking Skills	
Veronika Fitri Rianasari and Maria Suci Apriani	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
OPEN ACCESS	012084
Analysis of student errors in integral concepts based on the indicator of mathematical competency using orthon classification	
Yani Ramdani, Nety Kurniati, Erwin Harahap, Euis Setiawati, Nia Kurniati and Henriady de Keizer	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	
<b>Computational Mathematics</b>	
OPEN ACCESS	012085
Direct multistep method for solving delay differential equation with boundary conditions	
N T Jaaffar, Z A Majid and N Senu	
<a href="#">+ Open abstract</a> <a href="#">View article</a> <a href="#">PDF</a>	



PAPER • OPEN ACCESS

## The mathematics education department students' ability in mathematical literacy for uncertainty problems on PISA adaptation test

To cite this article: Febi Sanjaya *et al* 2019 *J. Phys.: Conf. Ser.* **1366** 012082

View the [article online](#) for updates and enhancements.

### You may also like

- [Designing PISA-like task on uncertainty and data using Covid-19 context](#)  
Zulkardi, D S Nusantara and R I I Putri
- [Student strategy in solving PISA problem through realistic mathematics education approach](#)  
K A Fitri, R Johar, C M Zubainur *et al.*
- [Designing PISA-like mathematics problem in covid-19 pandemic \(PISAComat\)](#)  
D S Nusantara, Zulkardi and R I I Putri



### 244<sup>th</sup> Electrochemical Society Meeting

October 8 – 12, 2023 • Gothenburg, Sweden

50 symposia in electrochemistry & solid state science

Abstract submission deadline:  
**April 7, 2023**

Read the call for papers &  
**submit your abstract!**

# The mathematics education department students' ability in mathematical literacy for uncertainty problems on PISA adaptation test

**Febi Sanjaya<sup>1</sup>, Dewa Putu W.P.<sup>2</sup>, Hongki Julie<sup>3</sup>, Ant. Yudhi Anggoro<sup>4</sup>, and M. Andy Rudhito<sup>5</sup>**

<sup>1,2,3,4,5</sup> *Mathematics Education Department, Sanata Dharma University, Paingan, Maguwoharjo, Sleman, Yogyakarta, Indonesia.*

<sup>1</sup>E-mail: febi@usd.ac.id

**Abstract.** The Programme for International Student Assessment (PISA) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students who are nearing the end of their compulsory education. In most of the PISA-related studies, more students as subjects than teachers. Even mathematics education students who are prospective teachers have not got a place in this PISA research. One of goals of this research was to describe mathematics education students' ability on PISA adaptation test. In this research, there were several steps to achieve the goal, that is (1) creating test questions by adapting PISA test, (2) validating test questions using expert validation, (3) asking the students to do the test, and (4) describing the students' solution test. The mathematics PISA adaptation test consist of 4 scopes, that is quantity, space and shape, change and relationship, and uncertainty. The test contained 13 questions, three quantity problems, three uncertainty problems, three change and relationship problems, and four space and shape problems. This research used 7 students of Mathematics Education Department of Sanata Dharma University as subject research. This research was a design research which developed by Cobb and Koenig. In the uncertainty area, all students answer correctly at the level 1 problem, six students answer correctly at the level 4 problem, two students answer correctly at the level 5 problem, two students answer correctly at the level 5 second problem, one student answers correctly at the level 6 problem. Therefore, the quality of mathematics education students' needs to be improved to reach the maximum level in PISA.

## 1. Introduction

Student achievement is closely related to the teacher's mathematical and pedagogical skills [1, 2]. In addition, teacher knowledge achieved by students has a significant relationship with teachers' perceptions [1, 2]. In this case, teachers' perceptions are defined as (1) teacher paradigms in the learning process of mathematics, and (2) teacher attention to students' math skills [1, 2]. Furthermore, mathematical knowledge of teachers is the main factor of teachers in giving attention to students' math skills [1, 2]. The Programme for International Student Assessment (PISA) is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students who are nearing the end of their compulsory education. Based on the opinion, the ability of teachers in managing the process of learning to teach mathematics and solve mathematics



problems is one of the determinants of student success in completing the PISA test. Most of the PISA-related studies, more students as subjects than teachers. Even mathematics education students who are prospective teachers have not got a place in this PISA research.

Therefore, this study aims to describe the solution of mathematics education students on PISA adaptation tests. This PISA adaptation test contains 4 topics, namely quantity, space and form, change and relationship, and area of uncertainty. However, in this paper the researcher will only explain the results of research for mathematics student education solution PISA adaptation test on the topic of uncertainty [3, 4, 5].

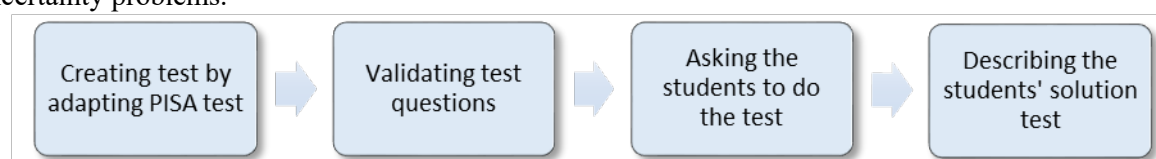
Mathematical literacy is the understanding of individual mathematics in applying it in everyday life [6]. Using mathematical literacy, students can understand and apply the role of mathematics in a real-life context. [2, 7, 8]. According to [3], mathematical literacy is the ability of a person to identify and understand the role of mathematics in real life, to make accurate judgments, use and involve mathematics in various ways to meet the needs of individuals as reflective, constructive and devoted citizens. The things that affect the ability of mathematical literacy are: (1) mathematical thinking and reasoning, (2) argument of logical ability, (3) mathematical communication ability, (4) problem modeling ability, (5) proposing and problem solving ability, (6) the ability to represent ideas, and (7) using symbols and formal language skills [7, 9].

In PISA, the problem of students' mathematical literacy is divided into 6 levels [3, 10]. Based on Julie's research [10], 83.33% of students reach level 4 and 38.89% of students reach level 5. Furthermore, this study will also look at the comparison of the results of students' ability to do the test with mathematics education students who are prospective teachers.

## 2. The research methodology

Design research has two characteristics that are process-oriented and oriented to usability [11]. One of the stages in this study, researchers developed a design of a test adapted from PISA. Researchers also described the mathematics education student's solution for the test. These results will be the basis for creating modules that contains a learning process that can be used to improve PISA competencies. Therefore, this research may be classified in the design research.

One of the study aims was to describe mathematics education student's solution on PISA adaptation test. The steps for research can be seen figure 1. In this paper, the researcher limited the discussion of the results of the study only to the subjects of research in mathematics education students and for uncertainty problems.



**Figure 1.** Research steps.

This test contained 13 questions, which consists of three quantity problems, three uncertainty problems, three for change and relationship problems, and four for space and shape problems. The test was done by students within 90 minutes.

This research used 7 students of Sanata Dharma University's Mathematics Education Departments as the subject of the research. The selection of students as the subjects of this study was conducted randomly proportional, then the best 7 student were selected as research subjects. The results will be presented qualitatively.

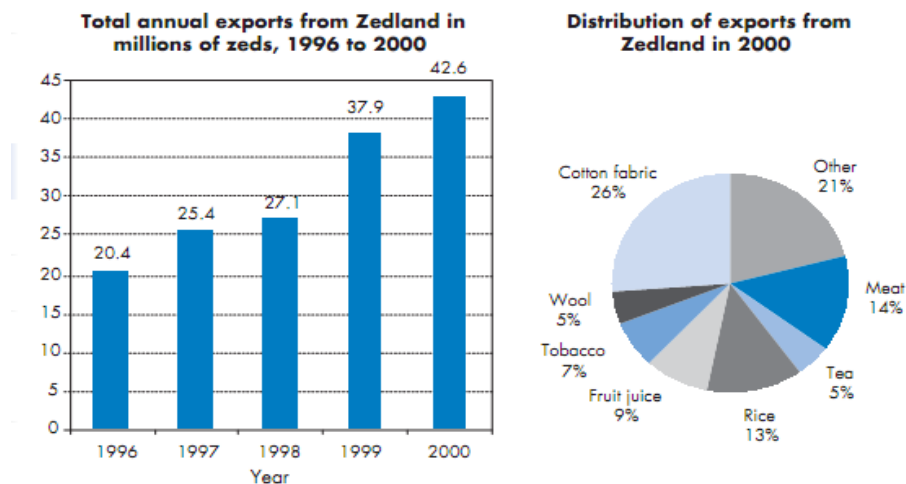
## 3. The Results and discussion

In this paper, the research results present the result of the PISA adaptation test on the uncertainty area [3, 4, 5]. The result were described as follow:



**Problem 1.** The Figure 2 shows information about exports from Zedland, a country that uses zeds as its currency. (see figure 2)

- a. What is the total value (in million zeds) of exports from Zedland in 1998?
- b. What is the value of fruit exported from Zedland in 2000?
  - A. 1.8 million zeds.
  - B. 2.3 million zeds.
  - C. 2.4 million zeds.
  - D. 3.4 million zeds.
  - E. 3.8 million zeds.



**Figure 2.** Distribution of exports from Zedland.

**Student's answer for problem 1a:**

The total value (in million zeds) of exports from Zedland in 1998 was 27.1. The solution was made by all students. Students' answer as above could be categorized as level 4 because the question is explicit and only needs to select relevant information from the chart.

**Students' answer for problem 1b:**

1. The value of the fruit is exported from Zedland in the year 2000 =  $\frac{9}{100} \times 42.6 = 3.834$  million zeds  $\approx 3.8$  million zeds. The answer was E. The solution was made by six students. Students' answer as above could be categorized as level 4 because they must understand the data on Figure 2 along with the relationship the two charts. In addition, they must also understand the representation associated with the topic of fractions, especially percent.
2. A. 1.8 juta zeds

$$\frac{1,8}{42,6} \times 100 = 4,1\%$$

The solution was made by one student.

a. Nilai total ekspor dari Zedland pada tahun 1998  
adalah 27,1 juta Zeds

b. Nilai buah yang diekspor dari Zedland pada tahun 2000

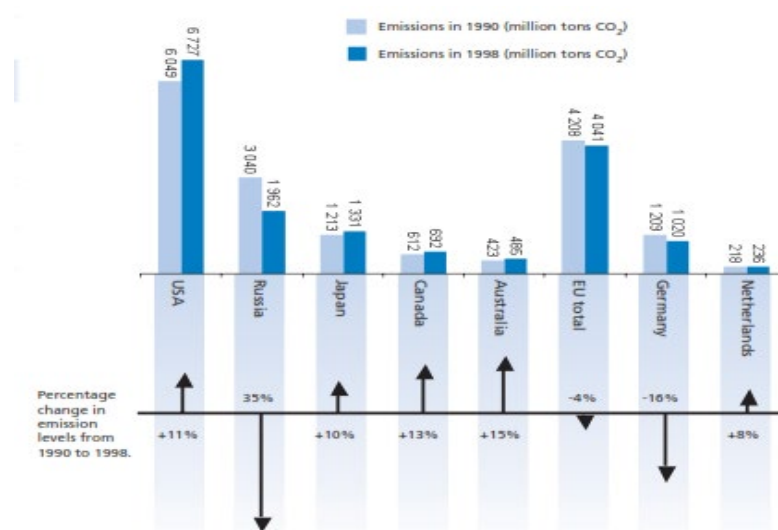
$$= \frac{9}{100} \times 42.600.000 = 3.834.000$$

$$= 3.834 \text{ juta Zeds}$$

$$\approx 3,8 \text{ juta Zeds (E) .}$$

**Figure 3.** Example of students' solution of problem 1.

**Problem 2.** Many scientists fear the increasing levels of  $CO_2$  gas in Earth's atmosphere caused by climate change. The Figure 4 shows that the level of  $CO_2$  emissions in 1990 (see bright bars) in some countries (or territories), emissions levels in 1998 (see dark bars), and percentage changes in emission levels between 1990 and 1998 (indicated by arrows and percentage).



**Figure 4.** The level of  $CO_2$  emissions in 1990.

- In the diagram you can read that in the USA, the increase in  $CO_2$  emission level from 1990 to 1998 was 11%. Show the calculation to demonstrate how the 11% is obtained.
- Mandy analyzed Figure 4 and claimed she discovered a mistake in the percentage change in emission levels: "The percentage decrease in Germany (16%) is bigger than the percentage decrease in the whole European Union (EU total, 4%). This is not possible, since Germany is part of the EU." Do you agree with Mandy when she says this is not possible? Give an explanation to support your answer.

**Students' answer for problem 2a:**

The increased  $CO_2$  emission levels from 1990 to 1998 is

$$\frac{(6727-6049)}{6049} \times 100\% = \frac{678}{6049} \times 100\% = \frac{67800}{6049}\% \approx 11\%.$$

The solution was made by two students.

Students' answer as above could be categorized as level 5 because they must did some following action:

- 1) Choose correctly the required data, i.e. emission of CO<sub>2</sub> in 1990 in the USA was 6049 and emission of CO<sub>2</sub> in 1998 in the USA was 6727,
  - 2) Choose a formula that suits the real situation, the percentage changing was
 
$$\frac{\text{new data} - \text{old data}}{\text{old data}} \times 100\%.$$
  - 3) Compare and evaluate the result with 11%.
- There were five students who didn't solve the problem.

#### Students' answer for problem 2b:

1. No, because EU is a union of many countries and every country has their enhancement or decline and if we calculate, the answer can be lower than one country (Germany).  
The solution was made by one student.  
Students' answer as above could be categorized as level 6 because:
  - a. they should be able to read data from a graph
  - b. they can interpret that the percentage of emission reduction data in Germany is 16% while in the EU is 4%
  - c. Understand the reality that Germany is part of the EU
  - d. They can also formulate and communicate their thoughts appropriately and in accordance with the real situation that the percentage decrease in the EU is 4% does not mean that all percentage declines in the EU state are 4%.
2. The student agrees with Mandy opinion because the percentage is calculated based on the region.  
The solution was made by one student.
3. There were five students who did not solve the problem.

a. Proses memperoleh 11%

$$\frac{(\text{Emisi CO}_2 \text{ tahun } 1998 - \text{Emisi CO}_2 \text{ tahun } 1990) \times 100\%}{\text{total emisi CO}_2 \text{ tahun } 1998 - 1990}$$

b. Tidak. Karena Uni Eropa adalah gabungan dari banyak negara dan tentu saja dari masing-masing negara yang ada di Uni Eropa kenaikan atau penurunannya berbeda, dan apabila ~~dit~~ dikalkulasikan jatuhnya dapat lebih rendah dibandingkan dengan 1 negara saja (misal Jerman).

**Figure 5.** Example of students' solution of problem 2.

**Problem 3.** In a country, a number of polls are conducted to find out much support for an upcoming presidential candidate. Four newspapers conducted a poll with the following results in table 1:

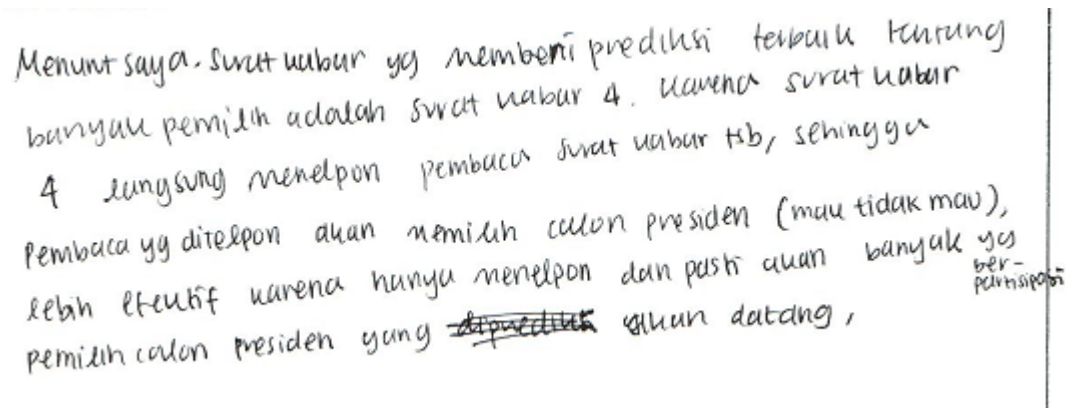
**Table 1.** Vote result of some newspaper.

Newspaper Name	Vote Result	Information
Newspaper 1	36.5 %	The poll was conducted on January 6th to 500 randomly selected people from voting citizens.
Newspaper 2	41.0 %	The poll was conducted on January 20th to 500 randomly selected people from voting citizens.
Newspaper 3	39.0 %	The poll was conducted on January 20th to 1000 randomly selected people from voting citizens.
Newspaper 4	44.5 %	The poll was conducted on January 20th to 1000 readers by phone

Which newspaper gave the best predictions about the number of voters, if the elections take place on 25 January? Give three reasons to support your answer!

### Students' answer for problem 3:

- The best predictions is Newspaper 3. The reason was: (a) the poll was conducted five days before the election time, so the owner have had a plan to choose, (b) the samples is 1000 people, so more samples can reduce errors, and (c) randomly choose. The solution was made by one student. Students' answer as above could be categorized as level 6, because the students:
  - must be able to understand complex problems in the problem associated with the real situation
  - filter information that is relevant to the real situation
  - could compare and evaluate existing data to solve the problem
- The best predictions was Newspaper 2. The reason was: (a) for 500 people, (b) if using 500 people the result is 41% then more people can make the result increase, and (c) respondents were selected randomly from citizens who have voting rights. The solution was made by one student.
- The best predictions was Newspaper 4 because the newspaper call the reader of their newspaper so this will make more effective. The solution was made by one student.
- The best predictions is Newspaper 3.  
The reason was: (a) the poll was conducted before the election time, (b) get support from 390 people, and (c) selected from citizens who have voting rights. The solution was made by one student.
- The best predictions was Newspaper 2 because from 500 people, 205 people give the support, it's mean more than half. The solution was made by one student.
- The best predictions is Newspaper 3. The reason was: (a) much samples, (b) the result is not far from newspaper 1 and newspaper 2 which get vote from phone, and (c) randomly selected. The solution was made by one student.
- The best predictions is Newspaper 4. The reason was: (a) the poll was conducted five days before the election time, (b) more samples, that is 1000 people, and (c) call the readers directly so they can find the another reason. The solution was made by one student.



Menurut saya, surat kabar yg memberi prediksi terbaik tentang banyak pemilih adalah surat kabar 4. Karena surat kabar 4 langsung menelpon pembaca surat kabar tsb, sehingga pembaca yg ditelpon akan memilih calon presiden (mau tidak mau), lebih efektif karena hanya menelpon dan pasti akan banyak yes ber-pemilihan pemilih calon presiden yang ~~di-prediksikan~~ akan datang,

**Figure 6.** Example of students' solution of problem 3

The following table summarize the results obtained by the student. Information in each level can be seen in Julie [10].

**Table 2.** The students' ability in the uncertainty area for the PISA adaptation test.

Problem	Student's Achievement Level	The number of student	Percentage
1a	Level 2	7	100,00%
1b	Level 4	6	85.71%
	Could not be leveled	1	14.29%
2a	Level 5	2	28.57%
	Could not answer	5	71.43%
2b	Level 6	1	14.29%
	Could not be leveled	1	14.29%
	Could not answer	5	71.43%
3	Level 5	1	14.29%
	Level 4	2	28.57%
	Could not be leveled	4	57,14%

From table 2, it can be seen that the mathematics education students' have been able to reach level 2 and level 4. This means that students of mathematics education students' have been able to solve complex mathematical problems that are sufficient to relate them to mathematical concepts they have understood. On the other hand, they are still struggling with level 5 and 6 problems. They have not been able to solve complex mathematical problems that contain deep thinking about mathematical concepts, filtering information, and connecting with reality.

The results above also indicate that the suitability of research conducted by Julie [10] related to PISA ability of students in uncertainty area, that is 83.33% of students achieved level 4 and 38.89% of

students achieved level 5. Therefore, it is necessary to improve the quality of mathematics education students' to be able to solve the PISA problem level 5 and 6 so that when they become a teacher, they can guide students in improving quality on problems related to PISA overall.

#### 4. Conclusions

Based on Section 4, it can be concluded that almost all students could solve level 2 and level 4 uncertainty problem. Five of seven students has not been able to complete a first level 5 uncertainty problem. Six of seven students have not been able to complete a second level 5 uncertainty problem. Six of seven students have not been able to complete an uncertainty problem for level 6. This means the students were still having difficulties with the PISA problems level 5 and level 6. Therefore, the quality of mathematics education students' needs to be improved to reach the maximum level in PISA.

Based on our research in 2018, learning approaches that might improve mathematical literacy skills were realistic mathematical approaches and reflective pedagogy. The study related to the influence of realistic mathematical approaches and reflective pedagogies on mathematical literacy skills was being conducted by us.

#### Acknowledgments

Our thanks to the Ministry of the Research, Technology and Higher Education has been funding this research so we could finish this research and present this publication through Penelitian Strategis Nasional Institusi 2018 grant distributed through the Sanata Dharma University.

#### References

- [1] Campbell, Patricia F, et all 2014 *Journal for Research in Mathematics Education* **45** 419
- [2] Julie H 2017 *International Journal of Science and Applied Science: Conference Series* **1** 55
- [3] Julie H and Marpaung Y 2012 *Widya Dharma* 23
- [4] OECD 2012 Assessment Framework. Key Competencies in Reading, Mathematics and Science (Paris: OECD)
- [5] OECD 2013 PISA 2012 Results: What students know and can do. Student Performance in mathematics, reading, and science (Paris: OECD)
- [6] Ojose B 2011 *Journal of Mathematics Education* **4** 89
- [7] Christiansen I B 2006 *Pythagoras* **64** 6
- [8] Stacey K 2011 *Journal Mathematics Education* **2** 95
- [9] Wijaya A 2016 *IndoMS Journal Mathematics Education* **7** 73
- [10] Julie H, Sanjaya F, and Anggoro A Y 2017 *AIP Conf Proc* **1868** 050026
- [11] Akker, Den J V, Gravemeijer K, McKenney S, and Nieveen N 2006 *Educational Design Research* (New York: Taylor and Francis Group)



# ICoAIMS2019

2nd International Conference on Applied and Industrial Mathematics and Statistics 2019

## *Certificate of Participation*

*This is to certify that*

**FEBI SANJAYA**

*has actively participated as a*

**PARTICIPANT**

*in*

**2<sup>nd</sup> INTERNATIONAL CONFERENCE ON APPLIED AND  
INDUSTRIAL MATHEMATICS AND STATISTICS 2019**

*on*

**23 – 25 July 2019**

*at*

**The Zenith Hotel, Kuantan, Pahang, Malaysia**

*Organised by*

**Faculty of Industrial Sciences & Technology  
Universiti Malaysia Pahang**



**Associate Professor Dr. Mohd Zuki Bin Salleh  
Chairman  
ICoAIMS 2019**