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Background 1

- Indonesia always had very low math performances in PISA (figure 1).
- The Ministry of Education and Culture of Indonesia (2014, p. 2) claims "It happened because the Indonesian curriculum did not cover lots of contents of PISA problems".

Questions

- Which mathematics contents of the PISA 2012 test are covered or not covered in the Indonesian 2006 Curriculum?
- Can we explain why Indonesian students had low mathematics performances in PISA 2012 from the curriculum analysis?

Background 2

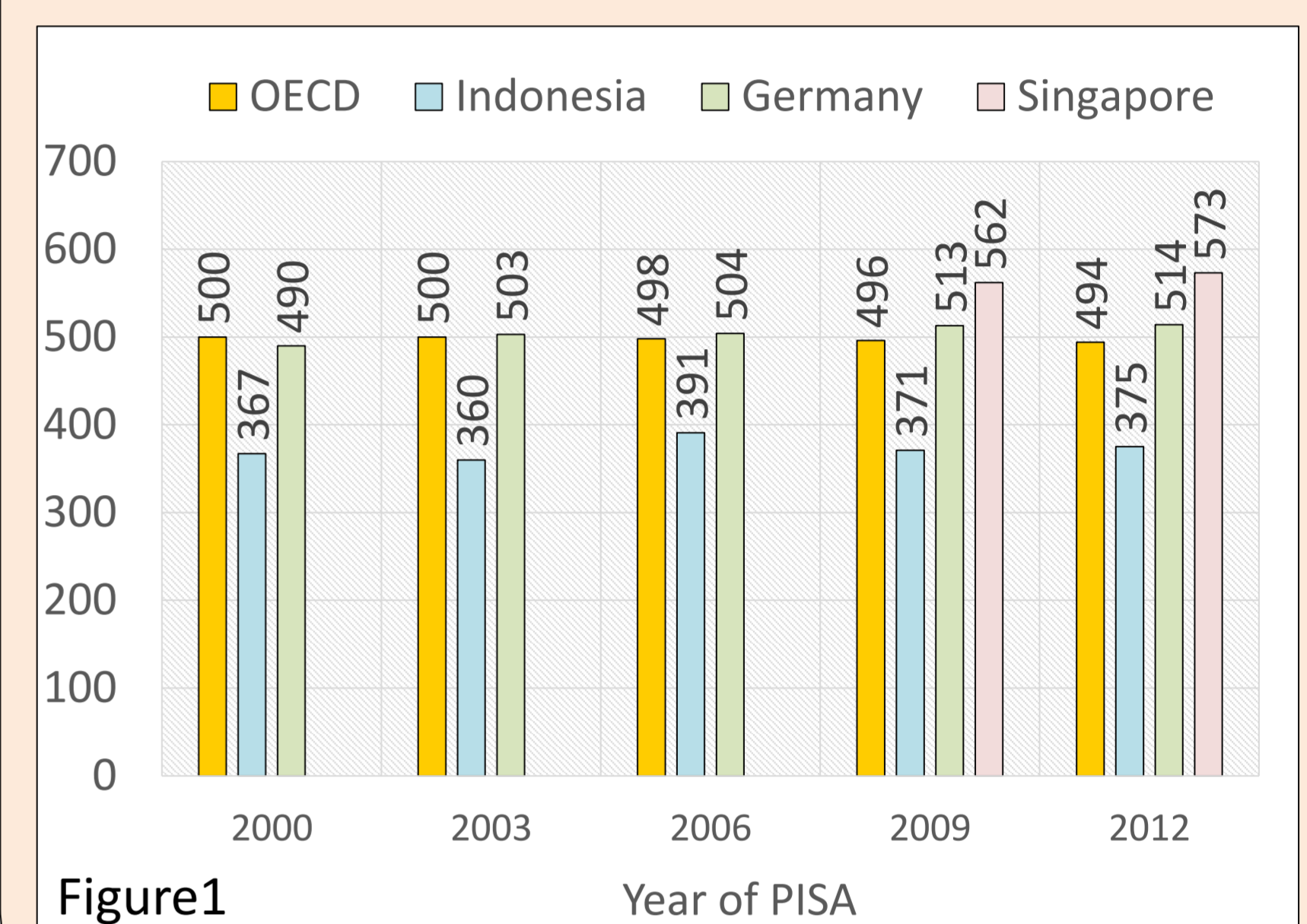
- To strengthen the analysis, we include mathematics curricula of Singapore (O-Level) and Germany (Gymnasium of NRW):
- Singapore always had very high performances.
 - Germany improved the performances after releasing a new mathematics curriculum.

Documents

- The Content Standards of the Indonesian 2006 Curriculum of Junior High School.
- The Secondary Mathematics Syllabus of the O-Level of Singapore, 2006
- The Curriculum of Gymnasium of a federal state, NRW of Germany, 2007

Method

- Curricula comparison by using document analysis method with the coding technique by Creswell (2003)
- Mathematics contents listed in the PISA 2012 mathematics framework (OECD, 2013a) as a basis for the analysis.



CAN THE CURRICULA COMPARISON EXPLAIN THE INDONESIAN STUDENTS' LOW PERFORMANCES IN PISA 2012?

Results

| Mathematics Contents | 2006 Curriculum of Indonesia | O-level curriculum of Singapore | NRW Curriculum of Germany |
|----------------------|---|---|---|
| Data Interpretation | Not covered | Covered • Grade: Secondary One • Topics: Statistic and Probability • Contents: "... interpretation of ... bar graphs ..." | Covered • Grade: 5 th /6 th • Topics: Stochastics • Contents: "... interpret statistical representation" |
| Proportion | Covered • Grade: 7 th • Topics: Numbers • Contents: "... proportions to solve problems" | Covered • Grade: Secondary Two • Topics: Numbers and Algebra • Contents: "... direct and inverse proportion" | Covered • Grade: 7 th /8 th • Topics: Functions • Contents: "... proportional and anti-proportional ..." |
| Arc length | Covered • Grade: 8 th • Topics: Geometry and Measurement • Contents: "... arc length and ..." | Covered • Grade: Secondary Three/Four • Topics: Geometry and Measurement • Contents: "... the arc length, sector area" | Covered • Grade: 7 th /8 th • Topics: Geometry • Contents: "... (circle calculations)" |

PISA 2012 DATA

(OECD, 2013b, 2013c, 2015)

An example of PISA 2012 questions related to data interpretations

Question 5 of "Charts" item

The percentage of students providing the correct answer

| OECD | Indonesia | Singapore | Germany |
|-------|-----------|-----------|---------|
| 76.68 | 48.16 | 85.63 | 77.00 |

An example of PISA 2012 questions related to proportions

Question 2 of "Sauce" item

The percentage of students providing the correct answer

| OECD | Indonesia | Singapore | Germany |
|-------|-----------|-----------|---------|
| 63.48 | 30.23 | 76.82 | 66.49 |

An example of PISA 2012 questions related to arc lengths

Question 2 of "Revolving Door" item

The percentage of students providing the correct answers

| OECD | Indonesia | Singapore | Germany |
|------|-----------|-----------|---------|
| 3.47 | 1.24 | 13.17 | 3.32 |

Discussions

- Data Interpretation is not covered in the 2006 Curriculum and less than half of Indonesian students could answer the problem.
- Proportion is covered in the 2006 Curriculum, but the percentage is much lower than OECD average.
- Arc length is covered in the 2006 Curriculum, but the percentage is very low. The curricula of Singapore and Germany also cover the content but it does not make them have good percentages.

Concluding Remarks

- It is difficult to explain why Indonesian students had low performances in PISA 2012 from the curricula comparison.
- Beside knowledge, there are capabilities such as devising strategies and reasoning that have important role in problem solving (OECD, 2013a). Students acquire them from the class that they engage in. Therefore, we continue to investigate teachers' beliefs and practices of problem solving.

THERE ARE REASONS TO BELIEVE THAT OTHER FACTORS – ESPECIALLY TEACHERS' BELIEFS AND PRACTICES – ARE MORE IMPORTANT TO EXPLAIN THE PISA RESULTS

CURRICULUM COVERING MATHEMATICS CONTENTS OF PISA TEST IS NOT A GUARANTEE THAT STUDENTS CAN SOLVE PROBLEMS RELATED TO THE CONTENTS

REFERENCES

- Creswell, J.W. (2003). *Research design – qualitative, quantitative and mixed method approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.
- OECD (2013a). *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. OECD Publishing. <http://dx.doi.org/10.1787/9789264190511-en>.
- OECD. (2013b). *PISA 2012 Released Mathematics Item*. Retrieved from <http://www.oecd.org/pisa/pisaproducts/pisa2012-2006-rel-items-maths-ENG.pdf>.
- OECD. (2013c). *Lessons from PISA 2012 for the United States, Strong Performers and Successful Reformers in Education*. OECD Publishing. <http://dx.doi.org/10.1787/9789264207585-en>.
- OECD. (2015). *Data base-PISA 2012: Compendium for the cognitive item responses*. Retrieved from <http://www.oecd.org/pisa/pisaproducts/pisa2012database-downloadabledata.htm>
- The Ministry of Education and Culture of Indonesia. (2014). *The Decree Number 58 Year 2014: 2013 Curriculum of Junior High Schools*. Jakarta: The Ministry of Education and Culture of Indonesia.