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An Interpretative Approach to Academic Performance:

Development and Implementation of Performance Assessment in JELS-Math

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Problem and Purpose

"The Era of Achievement Tests"

- Many achievement tests
  - by MEXT
  - by local boards
- Background
  - increasing demand for of accountability ⇐ New Public Management
  - new educational policies towards academic improvement ⇐ PISA shock
- Schools
  - more attention to academic achievement displayed by grades

Quality of Academic Achievement

- improving the quality of academic achievement

  ≠ raising the grades

- OECD/DeSeCo Project (2003) explores:
  - what competence should we cultivate in students?
  - what performance is an adequate index for such competence?

  ⟹ suggestive in reconsidering the quality of academic achievement and its improvement

Purpose of This Study

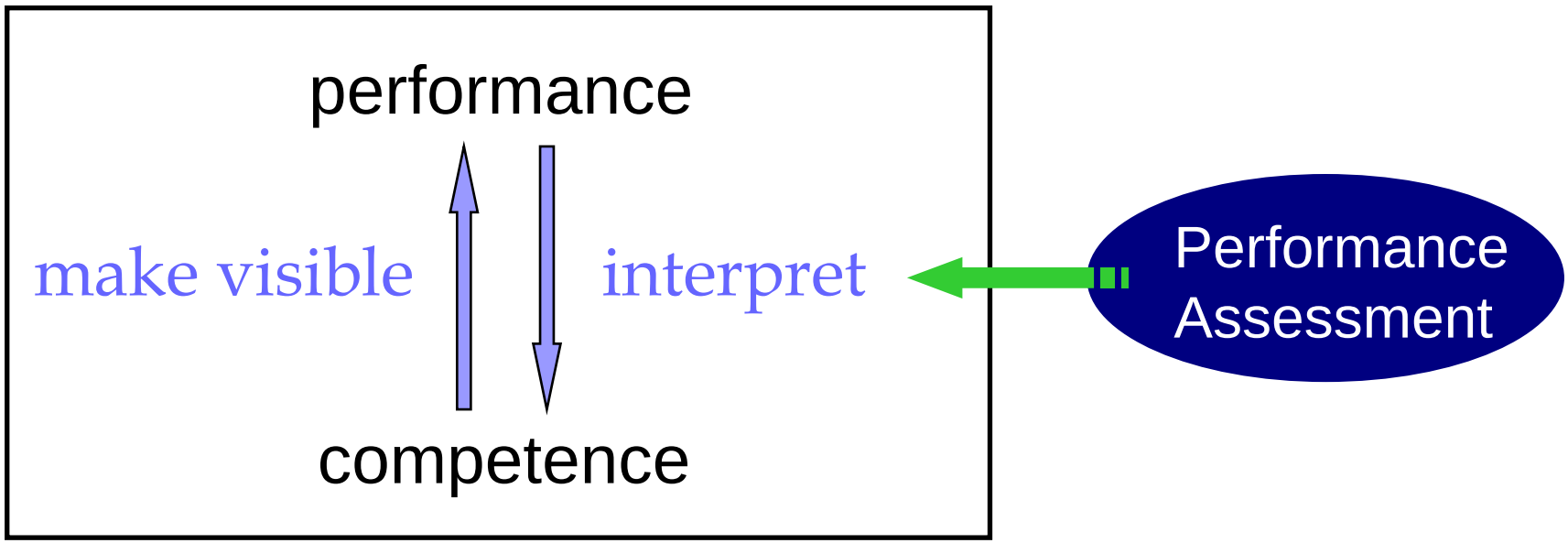
- Purpose
  - to explore the relationship between competence and performance by use of performance assessment
    - based upon my experience in JELS*

      *Japan Education Longitudinal Study
- Material
  - Performance assessment for the 6th grade students in mathematics

- Research Question
  - to judge the quality of academic achievement,

    -how should we make competence visible in performance?

    -how should we interpret performance into competence?



Method

What is JELS ?

- JELS (Japan Education Longitudinal Study)

  *subprogram of the 21st Century COE program "Studies of Human Development from Birth to Death" (Ochanomizu University) funded by MEXT

  - longitudinal study
    - 2003～ (every 3 years)
  - 3 areas

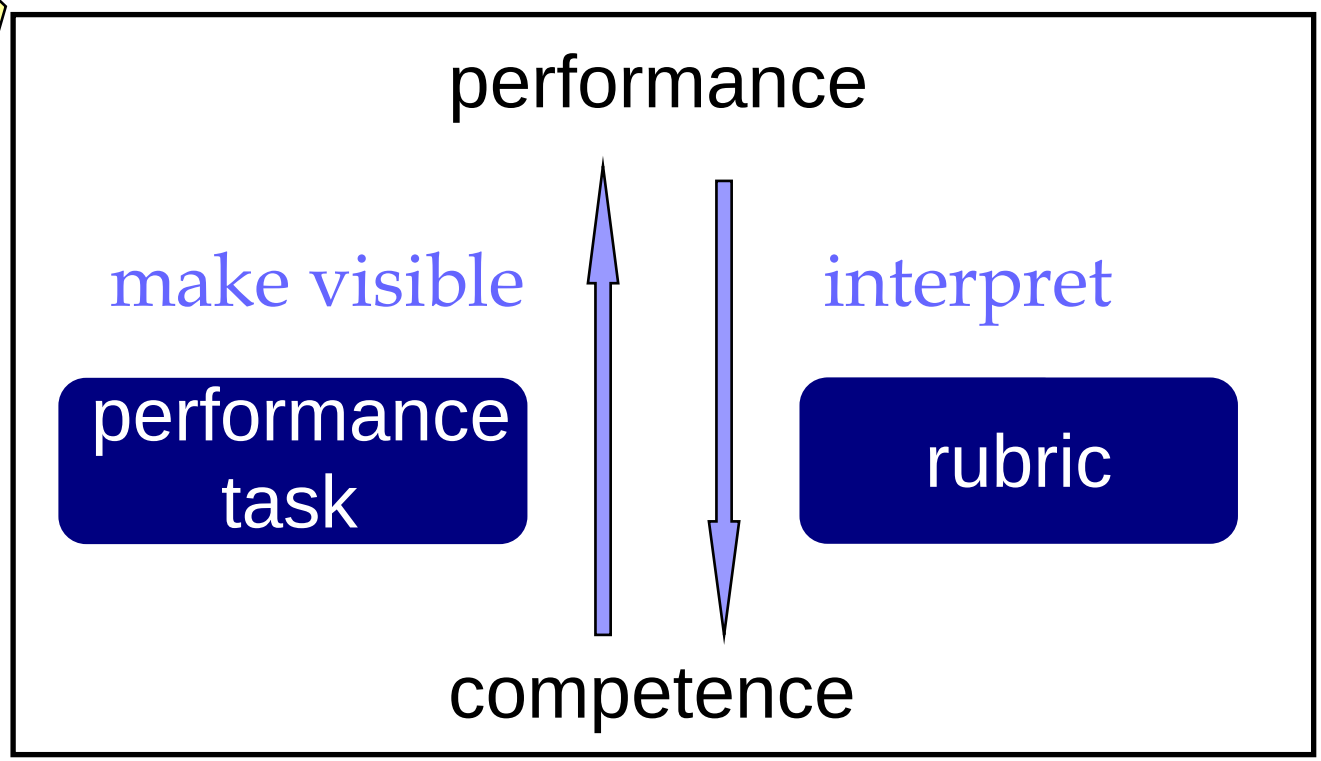
- My position
  - leader of mathematics study group (JELS-Math)

What is JELS-Math?

- Our task
  - to design assessment which will provide good quality information about students' performance
    - helpful for teaching & learning practice

      not just for accountability cf. Gipps (1994)
- Participants
  - 4 grades
    - 3rd, 6th, 9th, 12th (1,700～2,700 students per grade)
  - 3 areas
    - A (urban, public schools)
    - NS (urban, national school)
    - C (rural, public schools)

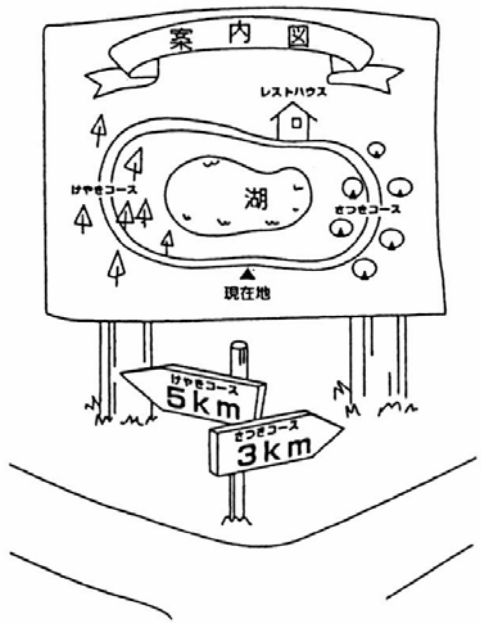
- Two instruments
  - Achievement Test (AT)
  - Performance Assessment (PA)



Performance Task (6th grade)

The children went hiking on a road. At a certain point the road branched off into two directions: Satsuki Course, which was 3 km long, and Keyaki Course, which was 5 km long. Both courses led to a rest house. The children decided to split up in two groups and meet at the rest house. Yuko Group took Satsuki Course, and Akio Group took Keyaki Course.

They split up at 10 am. The Yuko Group arrived at the rest house at 11 am and found that the Akio Group had not arrived there yet. "It is no wonder, because their course is longer than ours. How late will they be?" said Yuko and timed her watch to see how long it would them to arrive there. The Akio Group arrived 30 minutes later. Yuko asked them, "Did you take a break somewhere?" Akio answered, "No. We kept walking without any break". Both groups walked the courses at a uniform speed without taking rest.



They wanted to know which group walked faster. Which do you think was a faster group? Please write below your idea of which is a faster group and the reason why you think so.

- Characteristics of our performance tasks
  - 20-minute open-constructed response item (every grade)

-requires students to express their thinking processes

-allows them to use a variety of expressions (mathematical sentences, words, figures, and pictures)

-includes the process of relating mathematics to everyday situation

-allows multiple solutions

Rubric-making

- Our adopted rubric
  - based upon Mathematical Abilities in Reasoning and Communication (MARC) scoring rubric (Suzuki, 1998)
  - 4 categories: Conceptual Knowledge, Procedural Knowledge, Reasoning & Strategies, Communication
  - 4 skill-levels: 0 (no show) – 1 (low) – 2 (middle) – 3 (high)

Rubric (6th grade, part)

	Conceptual Knowledge	Procedural Knowledge	Reasoning & Strategies	Communication
3	a) extract correctly information on distance and time b) relate correctly time, distance, and velocity	a) make a necessary calculation correctly (e.g. multiplication and division of fractions and decimals, transform units, e.g., from hour to minute)	a) choose correctly which quantity or ratio to compare b) coherent and sequential in the way of comparing c) check whether the result makes sense from the meaning of the question	a) write the process and result using mathematical sentences, words, and so on b) explain sufficiently the reason of his/her idea
2	……	……	……	……
1	……	……	……	……
0	……	……	……	……

Rating Procedure

- The process of collaborative interpretation
  - conduct prior task analysis and list the expected solution
  - rate the responses by three persons (including me)
  - develop task specific scoring rubric during the process of rating
  - conduct group moderation
- The expected solution (see Table 2 in Appendix, in detail)

A1 A2	Compare using velocity (distance per hour) (distance per minute)
B	Compare using inverse velocity (minute per km)
C1 C2	Compare using distance for the same hours (3h) (1.5h)
D1 D2	Compare using time for the same distance (15 km, L.C.M.) (5 km)
E	Suppose both groups walked at the same speed for 3 km

Results and Analysis

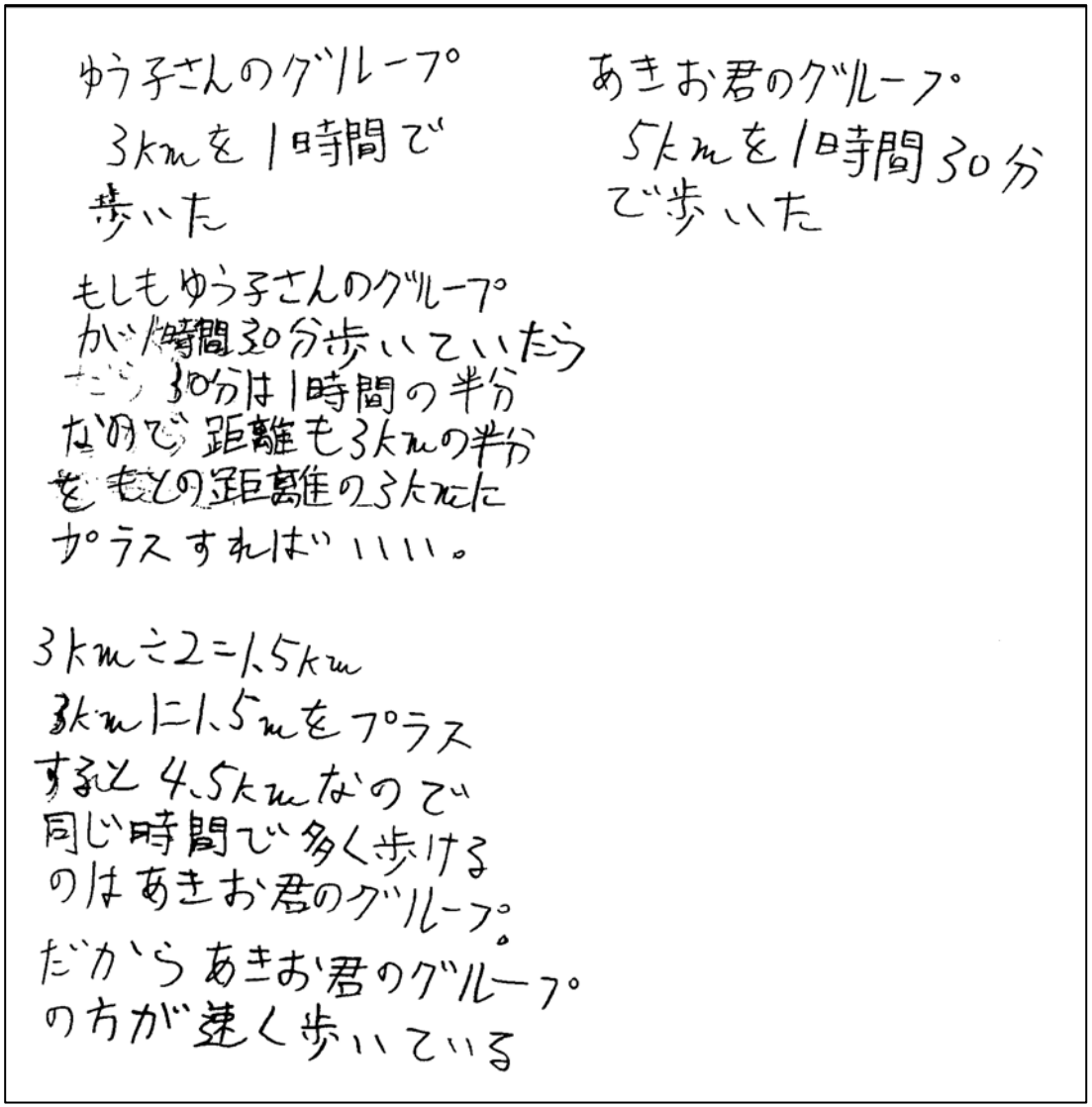
Analysis and Assessment of Performance

- Response analysis by solution type
  - expected solutions
    ↓
  - solution type

Simple	using one of the expected solutions	Example 1
Parallel	using two or more parallel solutions in one response	Example 2
Mixed	mixing (often incorrectly) two or more expected solutions	Example 3
New	using a new solution	Example 4
Inappropriate	using incorrect or no solution	Example 5

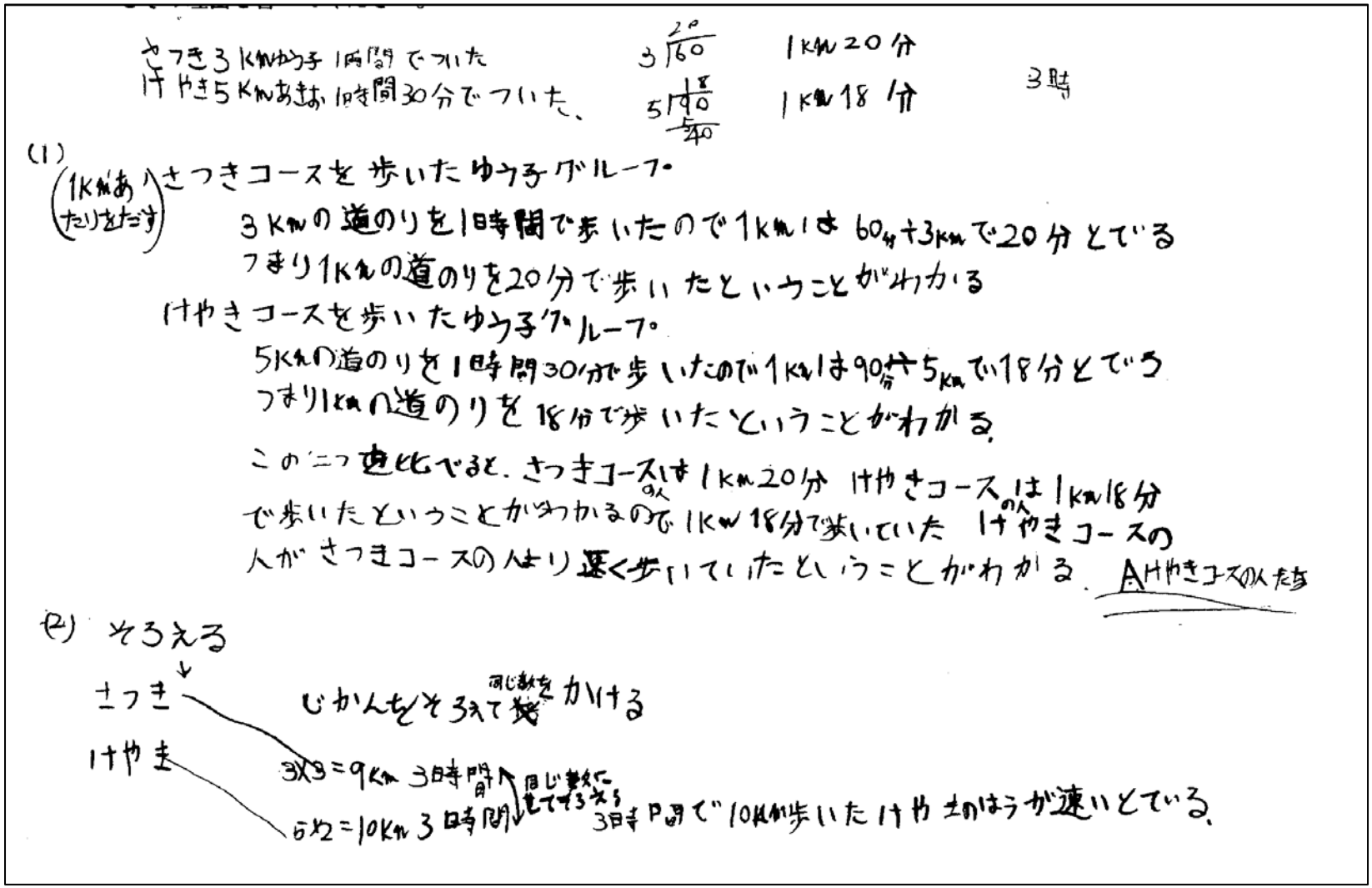
【Example 1】

- Solution type: Simple (C2)
- Score: CK=3, PK=3, R&S=3, C=3



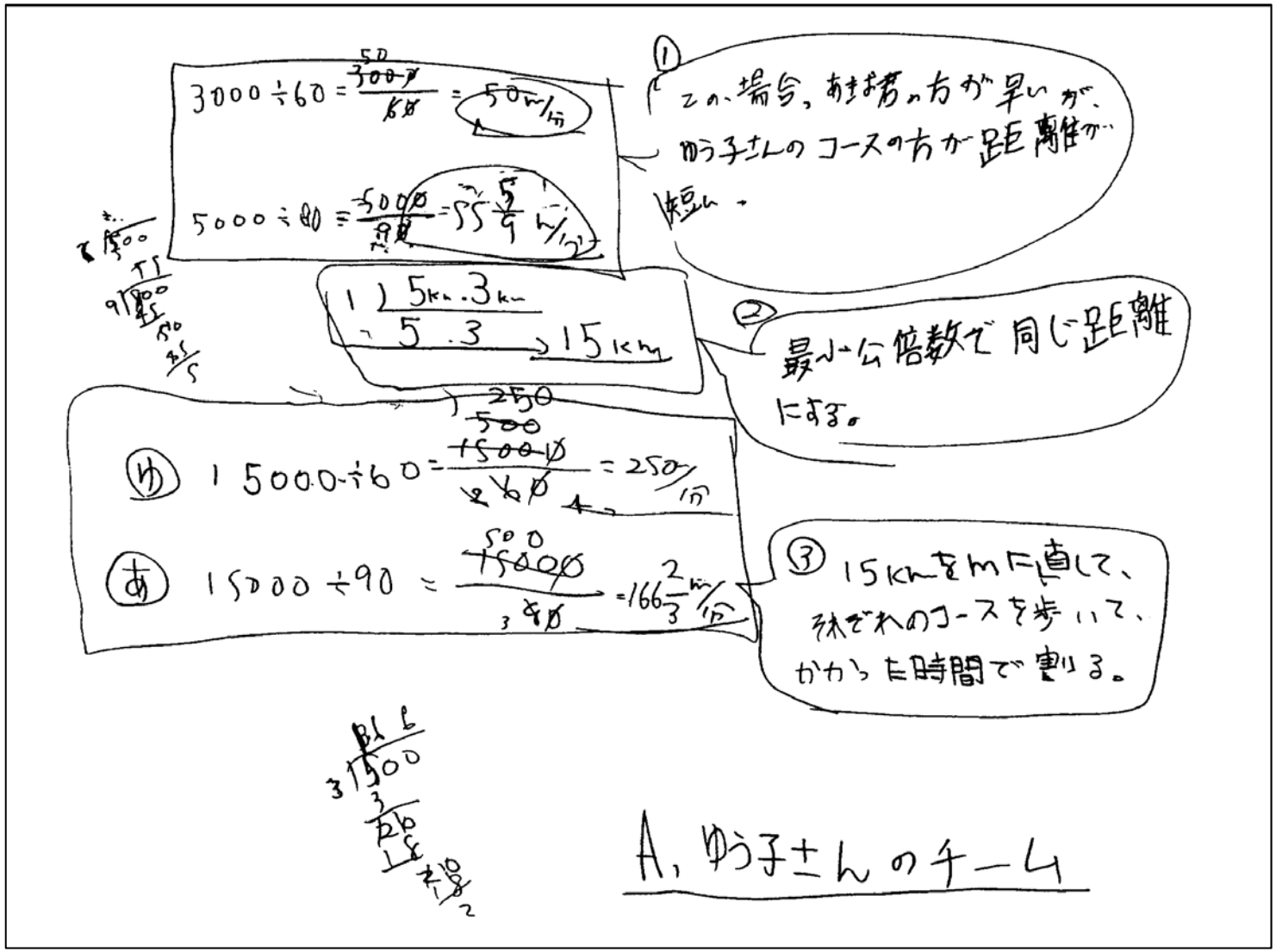
【Example 2】

- Solution type: Parallel (B & C1)
- Score: CK=3, PK=3, R&S=3, C=3



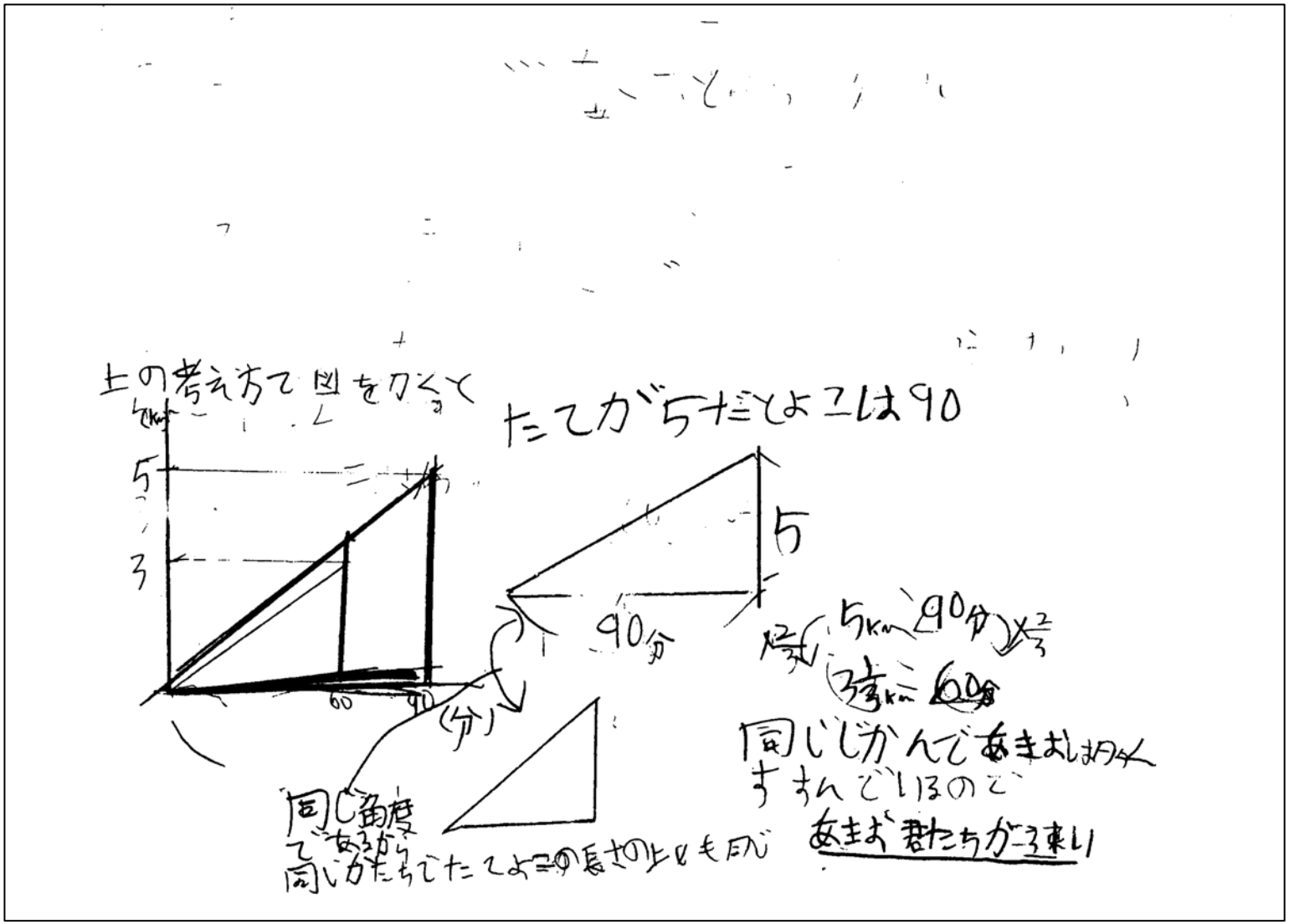
【Example 3】

- Solution type: Mixed (A2 & D1)
- Score: CK=1, PK=3, R&S=1, C=2



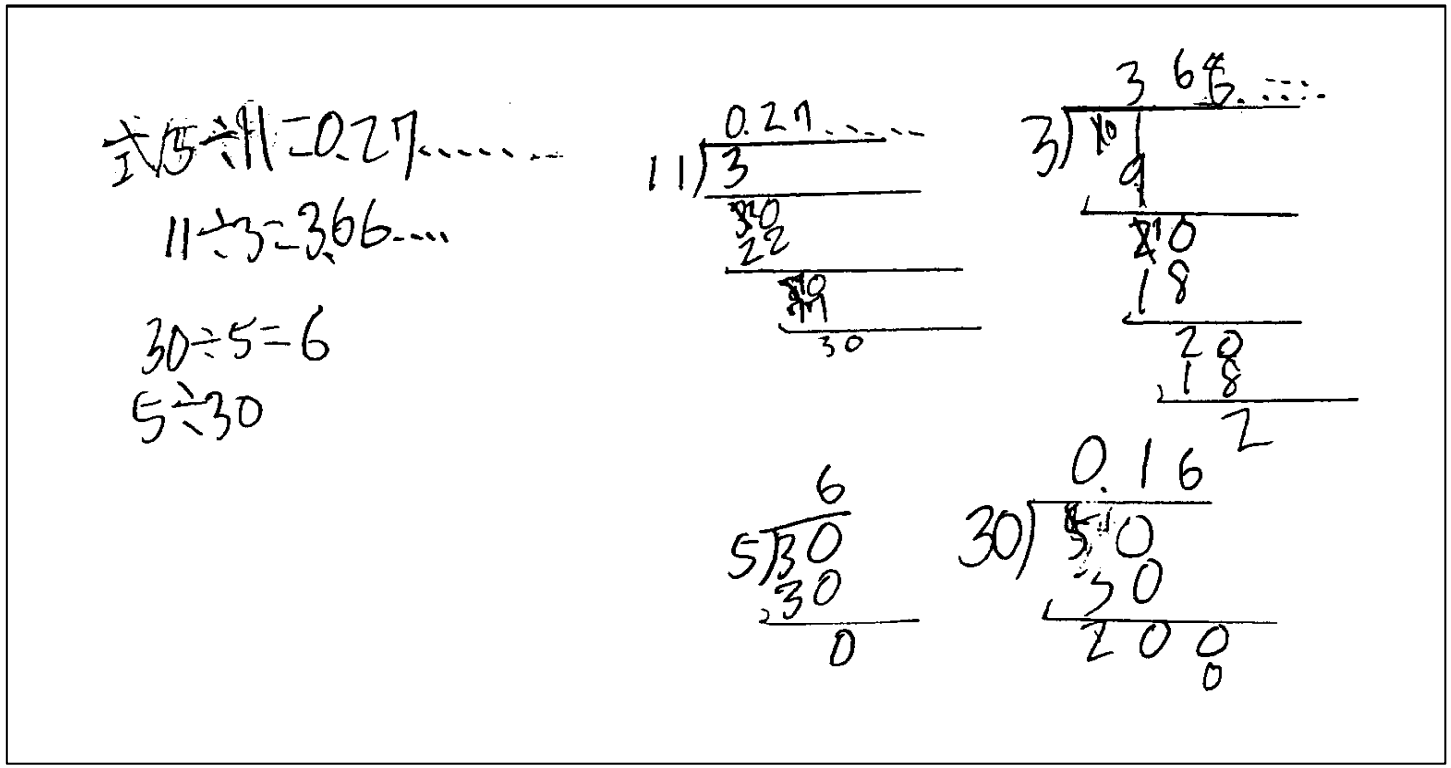
【Example 4】

- Solution type: New
- Score: CK=3, PK=3, R&S=3, C=2



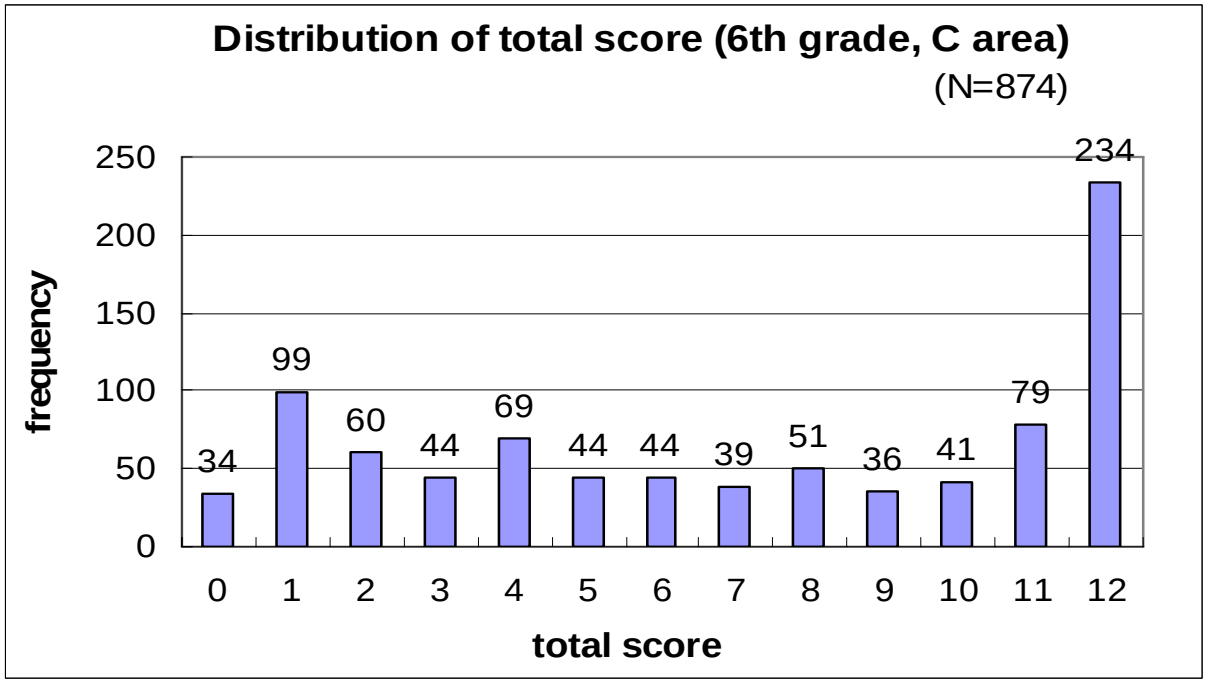
【Example 5】

- Solution type: Inappropriate
- Score: CK=0, PK=2, R&S=0, C=0



- individual student performance
  - content
  - expression style

Score Distribution

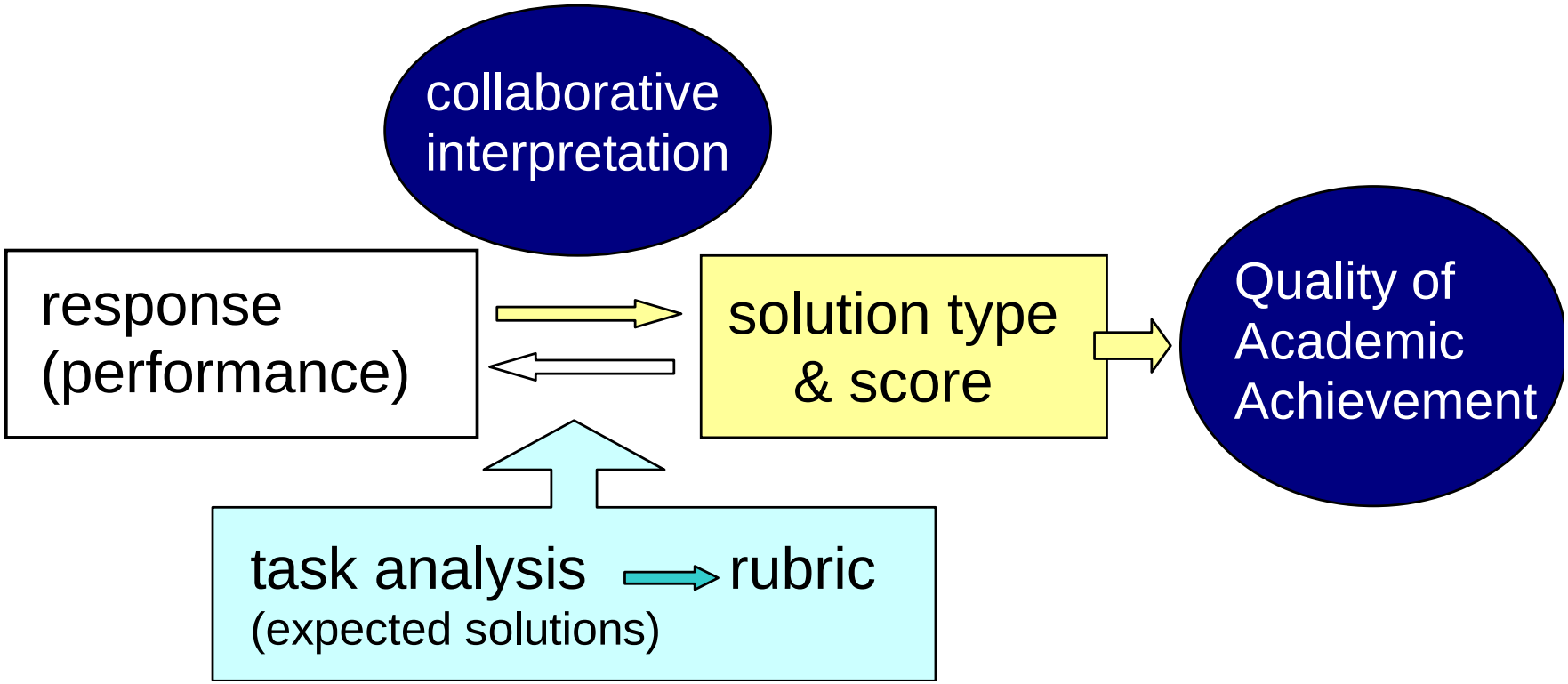


- Visible and invisible
  - visible: tendency of the student group
  - Invisible: quality of performance of each individual student

    ⇦ task dependency of performance assessment

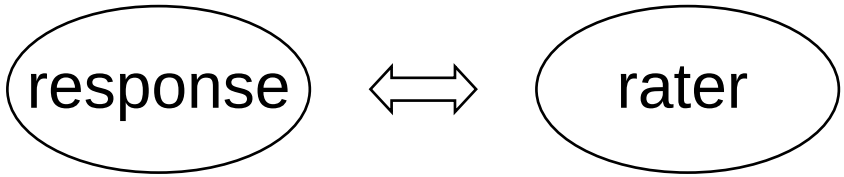
Conclusion

Interpretative Approach



PA as Interpretative Act

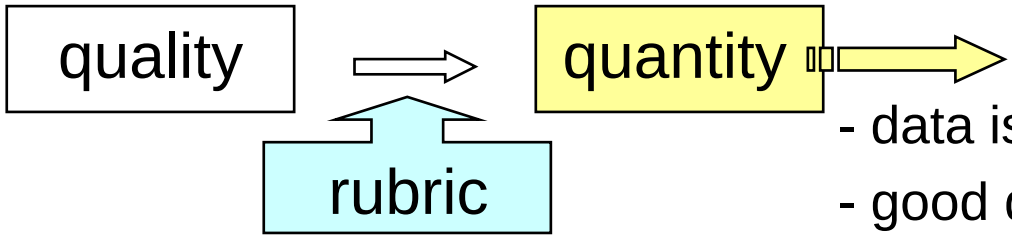
- Rating is a kind of interaction



- How do we deal with subjectivity?
  - sharing rubric, group moderation, example accumulation, rater training
    - ⇨ improvement of educational connoisseurship
- An opportunity for professional development
  - JELS 2006: assessment by schoolteachers

To Avoid a Pitfall of a Rubric

- Trap of a rubric



- data is condensed & summarized
- good quality information is lost

- Where is the quality?
  - not in scores
  - but in the response itself

- Rubric: A tool for interpreting

Thank you !

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- References

  - Gipps, C. V. (2001). *Beyond testing : towards a theory of educational assessment.* Falmer Press.
  - Rychen, D. C. & Salganik,L. H. (eds.) (2003). *Key competencies： For a successful life and a well-functioning society.* Hogrefe & Huber Publishers.
  - Suzuki, K. (1998). *Measuring "to think mathematically": Cognitive characterization of achievement levels in performance based assessment.* Doctoral thesis of University of Illinois at Urbana-Champaign.