

A NEW ITEM DESIGN APPROACH TO THE MEASUREMENT OF MENTAL PROCESSES

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Today's Agenda

- A historical view of the developments affecting the measurement of mental processes
- The learning capacity
- Earlier works inspiring the development of item design presented this study
- Introducing of new-designed testlet approach
- Pilot study
- Findings, Conclusion, and Discussion

Background

A historical view of the developments affecting the measurement of mental processes

- 1869, Francis Galton - Hereditary Genius
- 1879, Wilhelm Wundt - Institute for Experimental Psychology
- 1882, Francis Galton - Mental Testing Center
- 1890, James McKeen Cattell - Mental Tests and Measurements
- 1905, Alfred Binet & Theodore Simon - Binet-Simon Intelligence Test*
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Background (continued)

The learning capacity

- The intelligence quotient of an individual gives information about her/his mental capacity. However, we need more things to know about the individual in terms of educational measurements:

What and how much information has been learned?

Can the individuals relate the acquired information to each other, interpret and use them in new situations, or reveal new information?

Earlier works inspiring this study

Edward Lee Thorndike's Theory of Learning

- Stimulus (S) - Response (R)
- The Laws of Learning (1. Law of Readiness, 2. Law of Exercise, and 3. Law of Effect)
- Connectionism (The Contribution of Psychology to Education, 1910)

Theoretical framework (continued)

- In terms of how “learning” can develop and enrich, Benjamin Bloom (see Bloom *et al.*, 1956) described detailed processes related to learning capacity under the concept of “cognition” in the mids-1900s.
- Studies on the concept of "cognition", which deals with the learning capacity of humans more comprehensively, began to become widespread.
- Bloom's approach, which structured the cognitive, affective, and psychomotor domains separately, offered a different perspective to those interested in educational psychology and psychometrics. This point of view also greatly affected school programs.

Theoretical framework (continued)

- In the following years, especially after the 1980s, the criticisms directed at measuring these constructs separately led to the emergence of the alternative assessment approach (Brookhart, 2009, 2013; Haladyna, 1997; Kutlu et al., 2017; Marzano, 1992; Marzano & Kendall, 2007; NCLB, 2001; Popham, 2004, 2007; UNDP & UNICEF, 1990 as cited in Kutlu & Altintas, 2021).

The purpose of this study

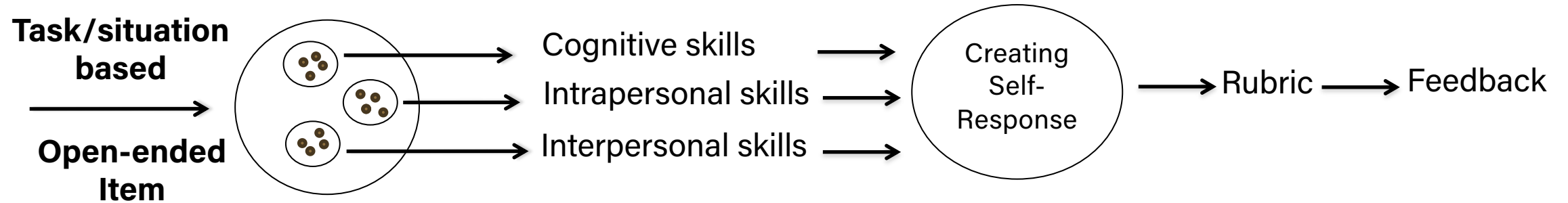
“Interconnectivity, Complexity, Wholeness”

- The underlying idea of this study is based on assessing the student’s learning capacity to use the knowledge learned in real-life situations by associating it with skills in cognitive, intrapersonal, and interpersonal competence areas.

Earlier publications inspiring this study

- Marzano, R. J. (1998). Cognitive, metacognitive, and conative considerations in classroom assessment. In N. M. Lambert & B. L. McCombs (Eds.), *How students learn: Reforming schools through learner-centered education* (pp. 241–266). American Psychological Association.
- Haladyna, T. M. (1997). *Writing test items to evaluate higher order thinking*. Viacom Company.
- Popham, W. J. (2000). *Modern educational measurement: Practical guidelines for educational leaders* (3rd Edition). Allyn and Bacon.
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Flow chart of the item design process including rubric and feedback



Process (continued)

Item writing process

1. Determination of the learning outcome.
2. Creating a real-life based situation to cover this learning outcome.
3. Defining the skills associated with all three competence areas.

Process (continued)

The learning outcome

The real-life based situation to cover this learning outcome

The skills associated with all three competence areas

Process (continued)

The skills* associated with all three competence areas

Cognitive Skills

Distinguishing differences
Problem-solving (identifying the problem)

Intrapersonal Skills

Being flexible and adaptable
Self-confidence

Interpersonal Skills

Assertive communication
Being respectful
Social influence with others
Being convincing

*21st century skills (National Research Council, 2012)

Participants and Measurement Tool

- A new-designed testlet* approach was piloted in a state school in Ankara province in Turkey.
- 6th grade students ($N = 130$)
- The testlet consists of 8 items** measuring cognitive, interpersonal, and intrapersonal skills, based on the same situation.

*The concept of testlet has been used as defined in Wainer *et al.*, 2007.

**Only three items have been presented as an example in this study.

Testlet

Sample situation

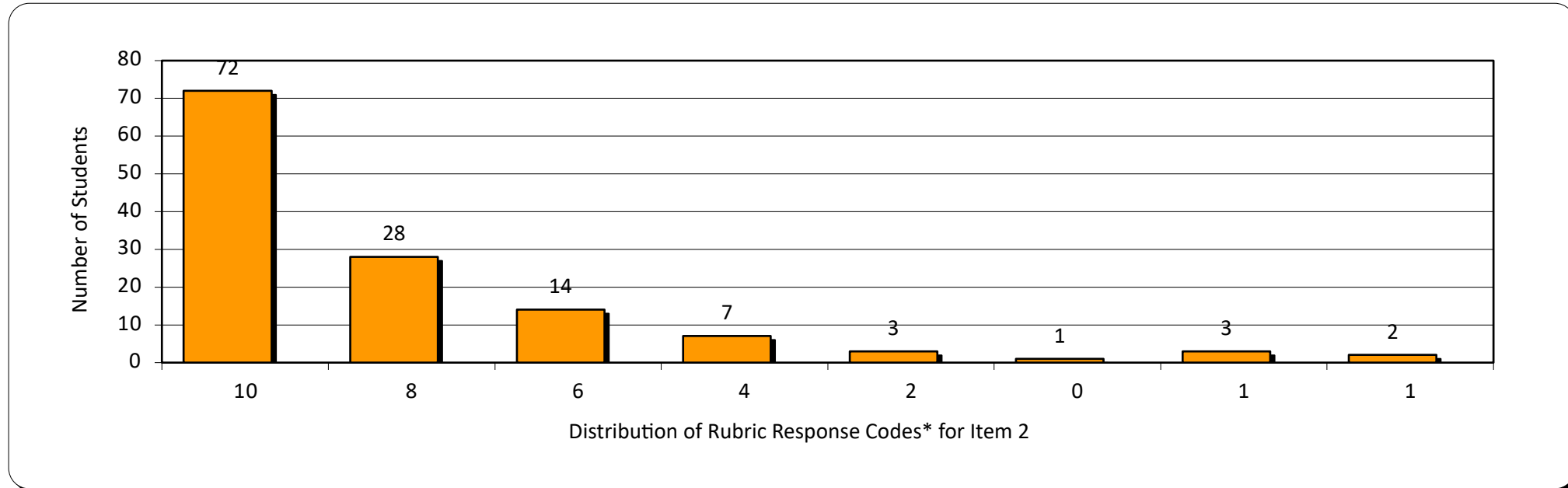
Cognitive (Item 2)

Interpersonal (Item 4)

Intrapersonal (Item 5)

Findings

Cognitive (Item 2)

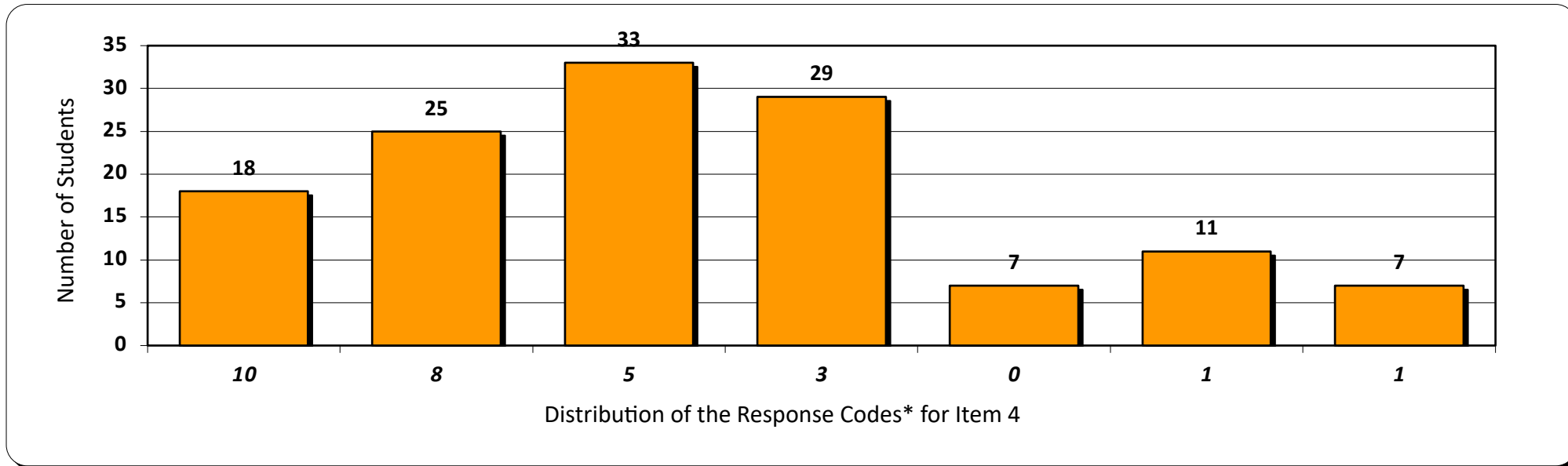


*The Response Recognition Codes in the Holistic Rubric for Item 2

- 10 for the *most correct answer*,
- 8, 6, 4, and 2 for *distant correct answers*,
- 0 for *blank answers*,
- 1 for *incorrect and irrelevant answers*, respectively.

Findings (continued)

Interpersonal (Item 4)

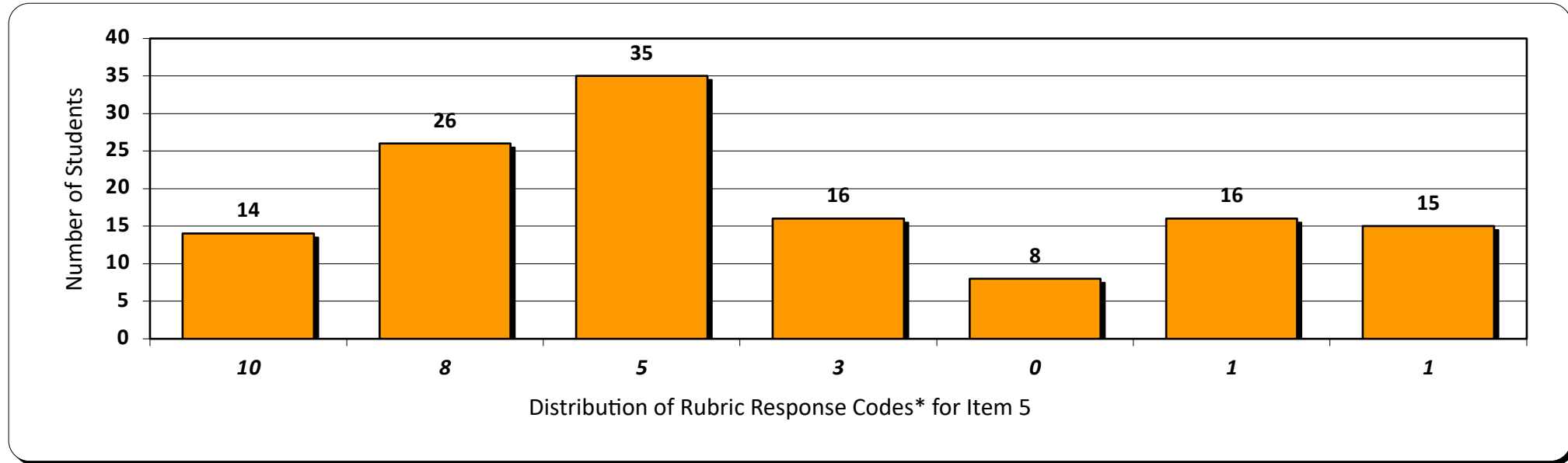


*The Response Recognition Codes in the Holistic Rubric for Item 4

- 10 for the *most correct answer*,
- 8, 5, and 3 for *distant correct answers*,
- 0 for *blank answers*,
- 1 for *incorrect and irrelevant answers*, respectively.

Findings (continued)

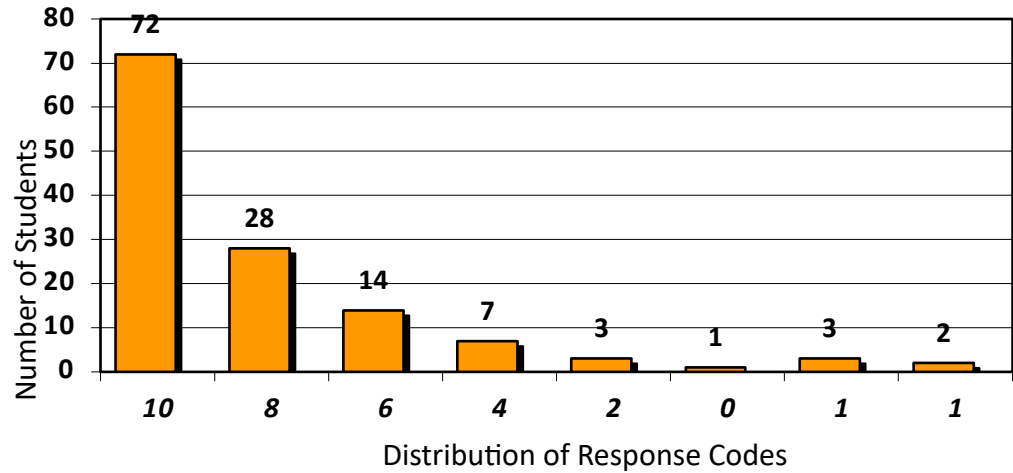
Intrapersonal (Item 5)



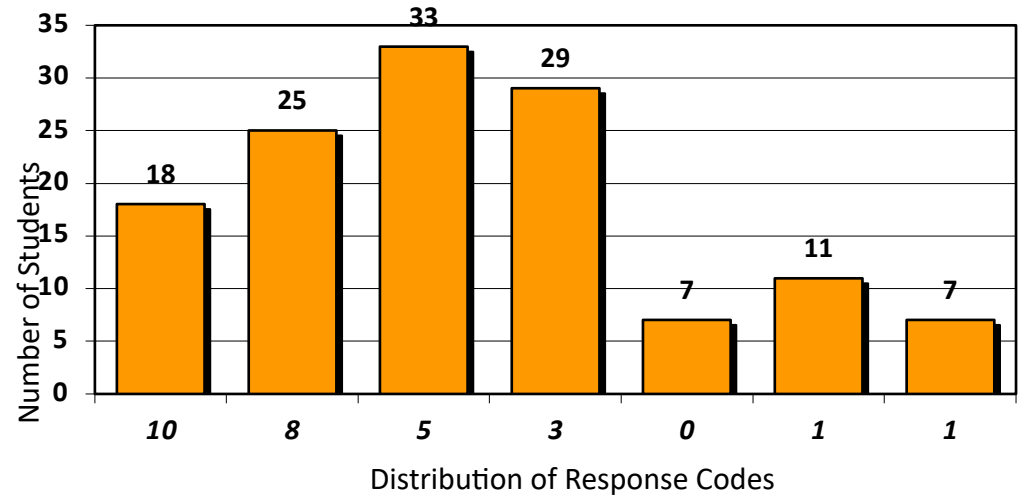
*The Response Recognition Codes in the Holistic Rubric for Item 5

- 10 for the *most correct answer*,
- 8, 5, and 3 for *distant correct answers*,
- 0 for *blank answers*,
- 1 for *incorrect and irrelevant answers*, respectively.

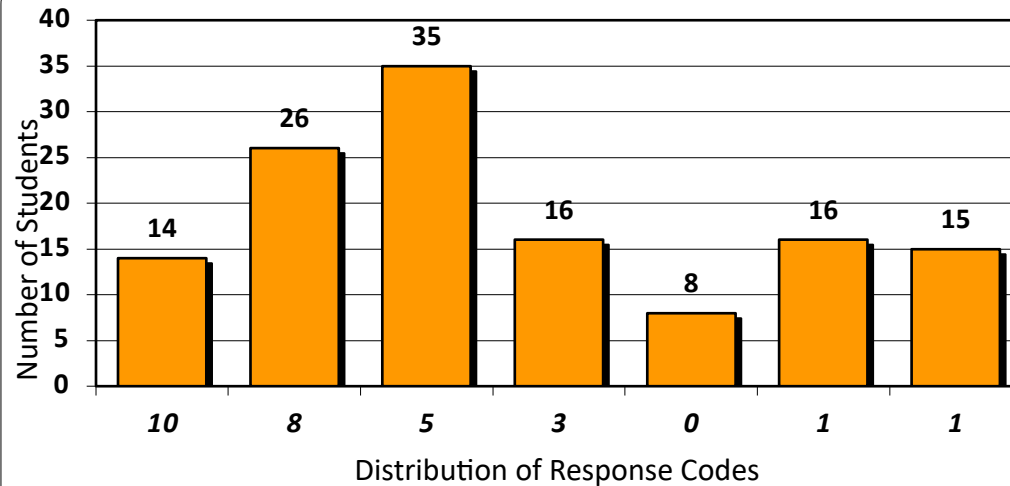
Findings (continued)



Cognitive (Item 2)



Interpersonal (Item 4)



Intrapersonal (Item 5)

Conclusion and Discussion

- ✗ Knowledge-based evidence is not sufficient.
- ✗ It is not enough to measure only at the cognitive level.
- ✗ It is not enough to measure the same subject with too many cognitive items.

- ✓ To assess the relevant learning outcome holistically.
- ✓ To be ensured that students use their competencies in real-life situations.
- ✓ To use the measurement and assessment approaches that prioritize feedback and require the use of more than one skill (cognitive, intrapersonal and interpersonal skills) at a time.

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THANKS FOR LISTENING!

Questions?

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