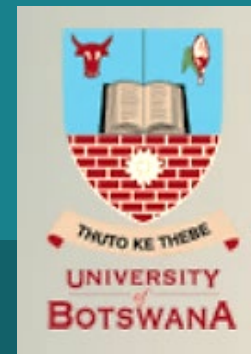


Gauging the Instructional Sensitivity of Ordinal Assessment Items

Özge Altıntaş, Yu-Hui Chang, Setlhom Koloi-Keaikitse, & Anne Traynor

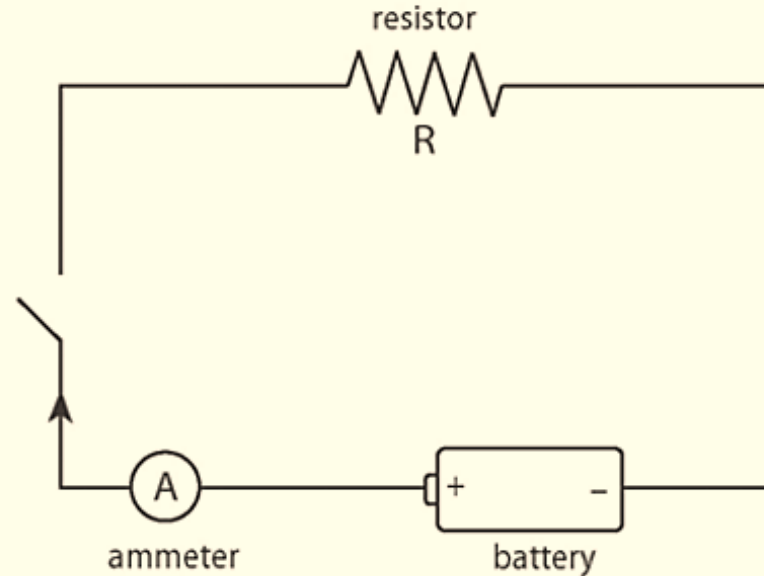


Instructional Sensitivity of Assessment Item Scores

- Some items become **easier** for students to **answer correctly** after their teacher has taught its **content topic**.
- Other items' difficulty is not affected by instructional content coverage.



Example: Item with High Instructional Sensitivity



In the circuit above, the battery is 4.5 volts. The ammeter reading is 0.5 amperes, when the switch is closed.

What is the resistance (R)?

_____ ohms



...The amount of voltage is there.
The amount of current is there.
So, I think this one, they'll be able
to understand it clearly. The only
problem is that this content is for
[next grade level]...

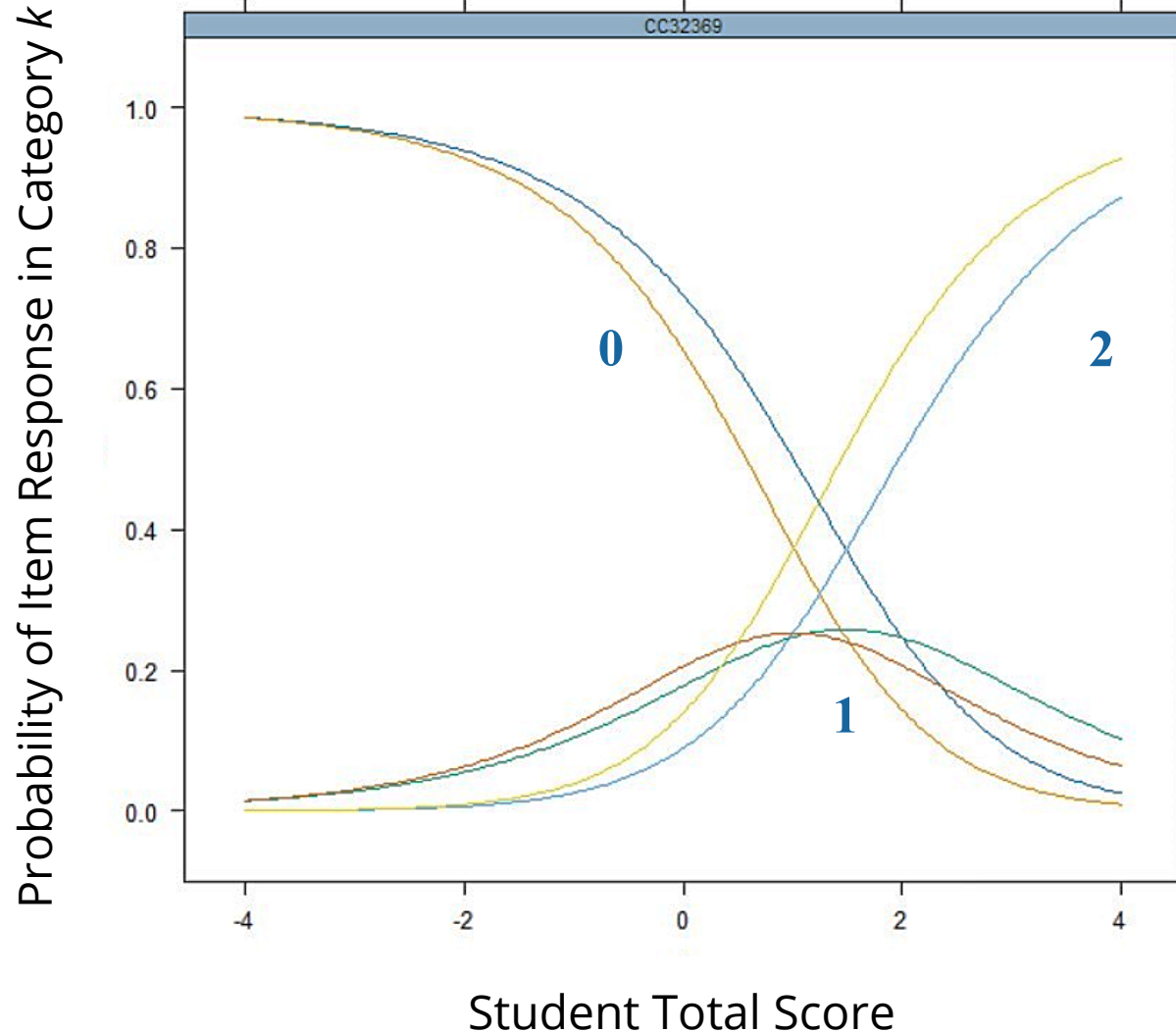
~ Master Teacher, Botswana

What are the **characteristics** of constructed-response assessment **items** and **rubrics** that yield **instructionally sensitive scores**?





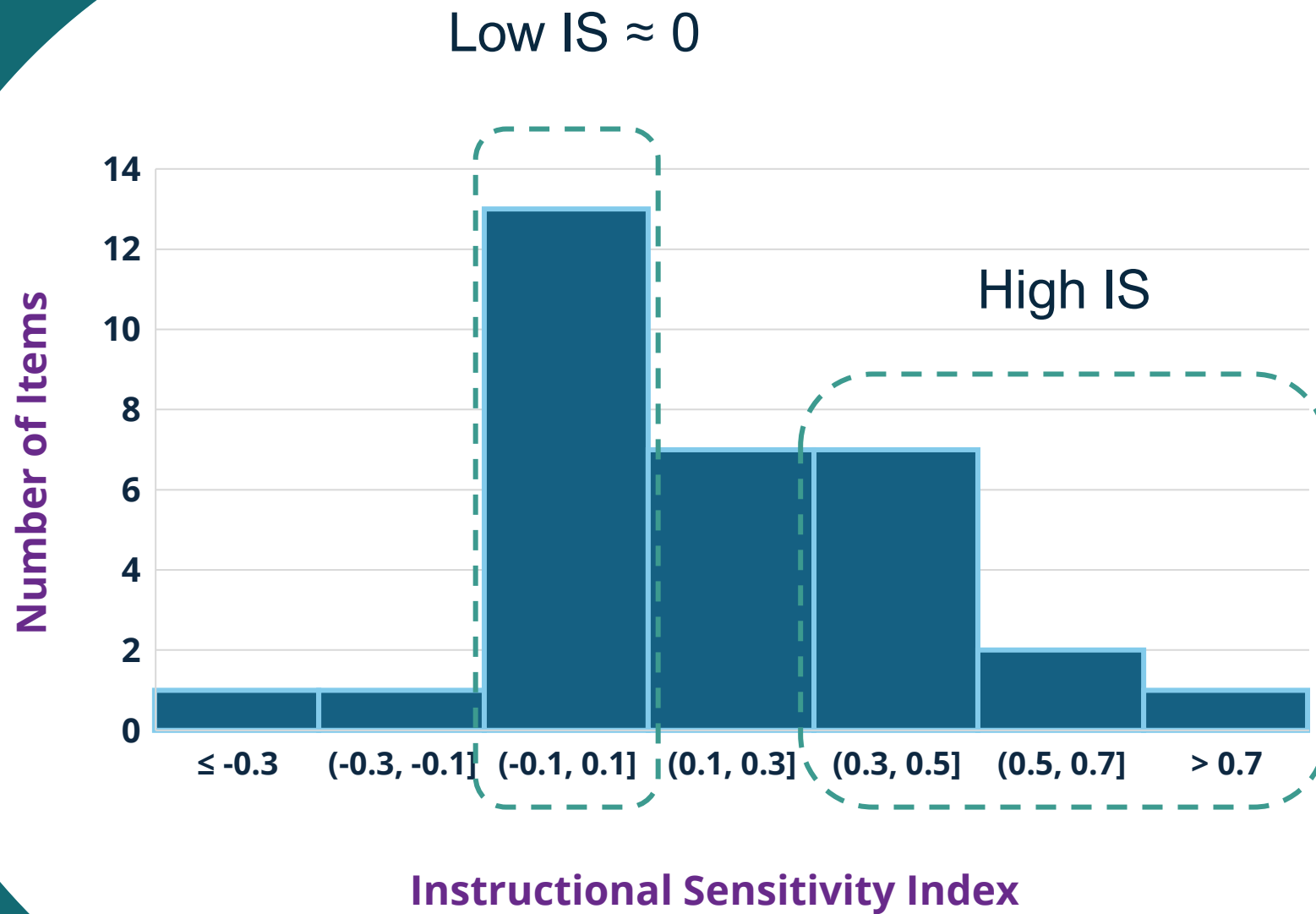
Item Instructional Sensitivity Index



Item category difficulty
difference for student groups
with and without content topic
instruction?

$$IS = b_{j,0} - b_{j,1} = .37$$

Instructional Sensitivity Indices for 32 TIMSS Science Constructed-Response Items



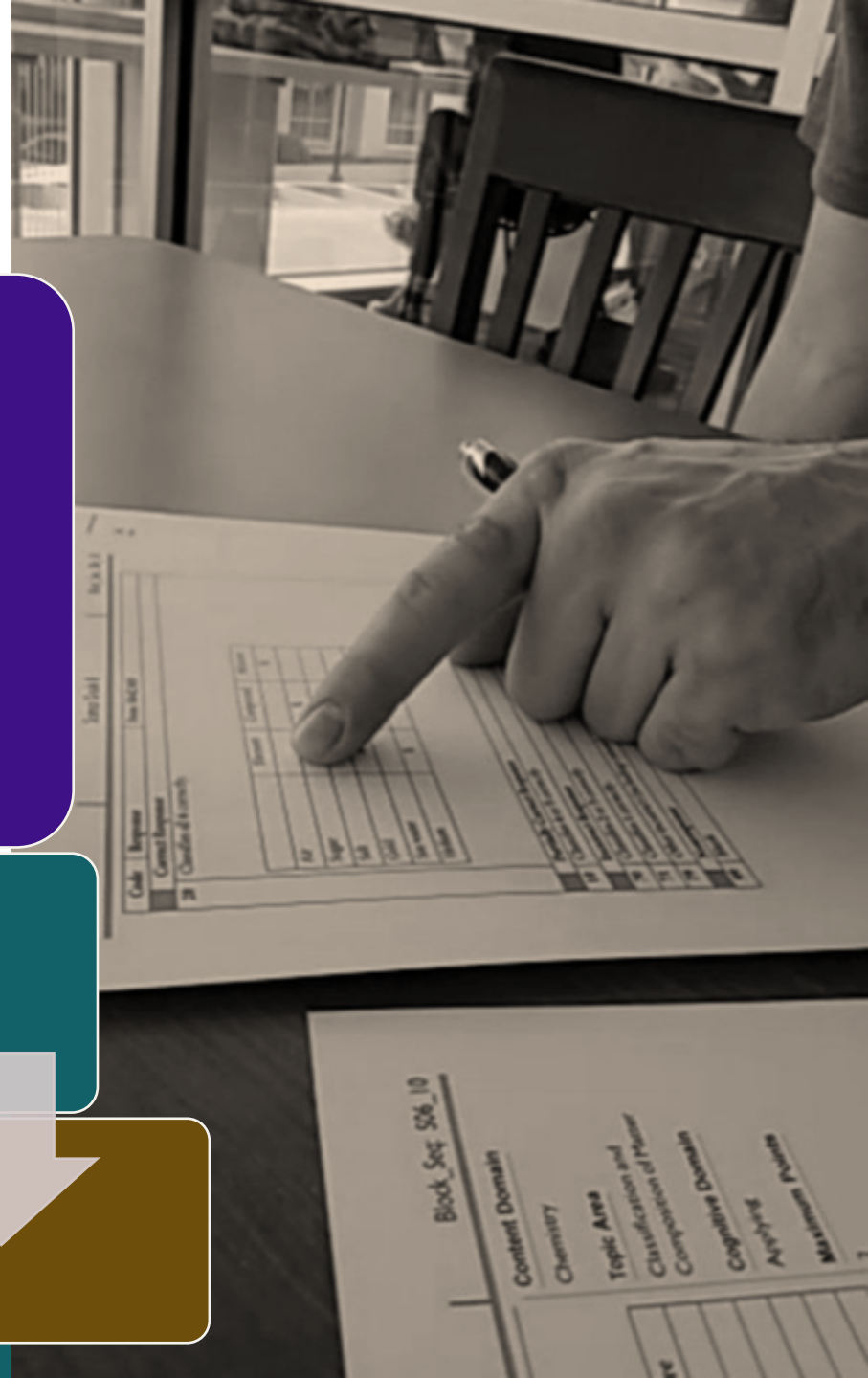
Methods

Item content analysis interviews with two master Grade 8/9 science teachers in Botswana, Chinese Taipei, Türkiye, and United States.

Predict the cognitive response processes of students who have (not) had instruction about item's content topic

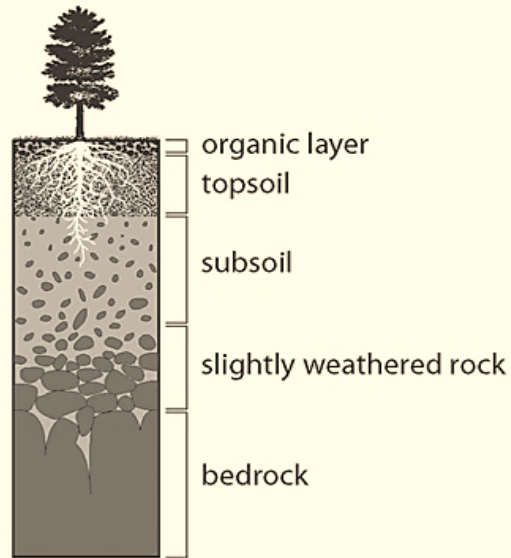
Reflexive thematic analysis of interview transcripts

Inform item and rubric design guidelines



Item with Low Instructional Sensitivity: Everyday Knowledge

The diagram shows layers in the soil.



Most plants have roots that grow in the topsoil, but some have roots that reach into the subsoil.

Write two advantages for a plant to have long roots that go down into the subsoil.

1.

2.

Correct Response

Identifies any **two** advantages from the list of acceptable responses below.

- Long roots can reach more nutrients (minerals).
- Long roots can reach water (when topsoil is dry or frozen).
- Long roots can anchor the plant better.

Partially Correct Response

Identifies **one** acceptable advantage only. The second advantage may be incorrect or missing.

Students who live in rural areas
can recognize this situation
without much difficulty....
~ *Master Teacher, Türkiye*

Item with Low Instructional Sensitivity: Clarity

Object X floats half submerged in Liquid A as shown in the diagram below.

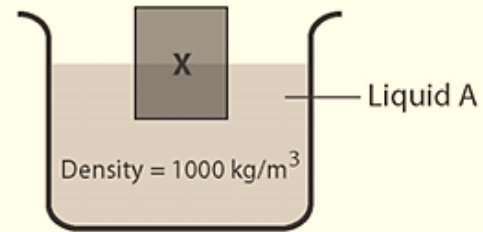


Diagram A

Diagrams B and C show Object X floating in Liquid B and Liquid C.

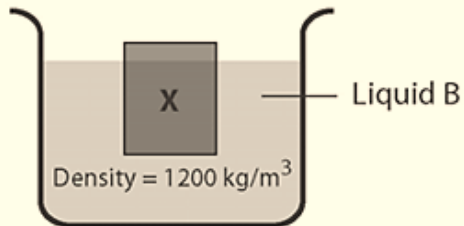


Diagram B

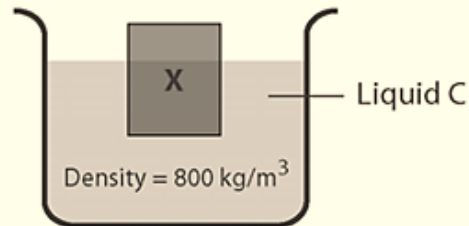


Diagram C

Which diagram is correct?

(Check one box.)

☐ Diagram B

☐ Diagram C

Explain your answer.

Source: TIMSS & PIRLS
International Study Center, Boston
College, and International
Association for the Evaluation of
Educational Achievement. (2016).
TIMSS 2015 Restricted-Use Items,
Science – Eighth Grade.

I can see students struggling with
this [pointing at diagram]
because...I don't know how much
they're gonna pay attention to the
differences in density.

~ *Master Teacher, USA*

Item with High Instructional Sensitivity: Vocabulary

The table below shows some elements, compounds, and mixtures.

Classify them by putting an X in the appropriate column beside each one.

	Element	Compound	Mixture
Air			
Sugar			
Salt			
Gold			
Sea Water			
Helium			

...Students may have had exposure to concepts like sugar or air (pollution), but without the scientific foundation from class, their answers might be incomplete or incorrect...

~ *Master Teacher, Chinese Taipei*

Item with High Instructional Sensitivity: Explanation

Earthquakes occur in many parts of the world.
What causes an earthquake?

Correct Response

Refers to earthquakes caused by movement along a fault (boundary) OR to plates moving.

Examples:

The earth's plates either pushing, pulling, or sliding against or apart from each other, which makes the Earth shake.

The tectonic plates moving, causing friction to build up and be suddenly released.

When two plate boundaries transform or rub against one another.

Transform boundaries or two plates rubbing together.

Tectonic plates crashing.

When tectonic plates collide, one goes on top of the other.

Earthquakes are caused by the changing of the plates.

By plates which are moving on our earth.

Shifting of the plates.

Refers to earthquakes caused by magma movement (volcanic activity).

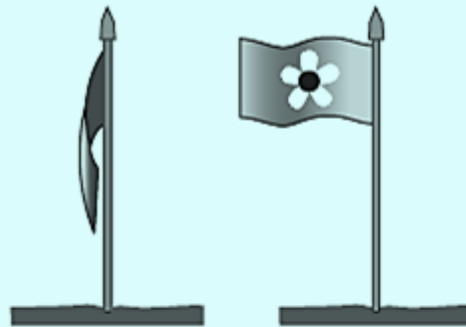
...They may get part of the answer right, but their explanation may be too shallow to receive full credit...

~ Master Teacher, Botswana

Test Instructions about Science Explanation

For some questions, you must write your answer in the space below the question. Words, drawings, or numbers are used in answers to these questions. Example 1 shows a question like this.

There is a flag in John's garden. Sometimes it hangs from the flag pole and sometimes it waves as shown below.



What makes the flag wave?

The wind makes the flag wave.

Source: TIMSS & PIRLS International Study Center, Boston College, and International Association for the Evaluation of Educational Achievement. (2011). *TIMSS 2011 Assessment: Science – Eighth Grade*. Authors.



Our team values your feedback ideas!



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