

The Teacher Instructional Practices and Processes System (TIPPS) in Honduras

November 28, 2023

Outline

El Sistema de Aprendizaje Tutorial

The Teacher Instructional Practices and Processes System

The Teacher Instructional Practices and Processes System and SAT

Measurement Invariance: Assessments and Scales

El Sistema de Aprendizaje Tutorial

El Sistema de Aprendizaje Tutorial (SAT) is a secondary school program that supports education in rural areas. It is currently endorsed by several Ministries of Education in Colombia, Honduras, Brasil, Ecuador, and Nicaragua. Among its many strengths are the following:

- Strong community-school partnership
- Non-traditional pedagogical relationships
- It has developed its own textbooks derived from action-based research in the community
- it is flexible
- Curricular content: 1) integrates different disciplines and theory-practice approach and 2) Focus on concepts.

SAT is particularly strong in Sciences and Mathematics, which are core areas we assessed.

TIPPS

The Teacher Instructional Practices and Processes System is a research instrument and feedback tool to further improve teaching practices.

It aims to support teachers' pedagogical practices in low-resource contexts. TIPPS validity framework has four goals:

- research utility
- practical utility
- cultural relevance and significance
- usability

TIPPS in Honduras

3 waves of data collected in two years

	March 2020	March 2022	November 2022
Students (7th and 8th grade)	1,044	939	848
Tutors	61	12	59
Coaches	31	55	97

Outcome measure: Science Assessment

Grade	Difficulty	Content Domain	Cognitive domain
7th	Easy-intermediate	1. Earth and Environmental Science	1. Application
		2. Life Science	2. Reasoning
		3. Physics and Chemistry	3. Knowledge
8th	Easy-Intermediate	1. Earth and Environmental Science	1. Application
		2. Life Science	2. Reasoning
		3. Physics and Chemistry	3. Knowledge

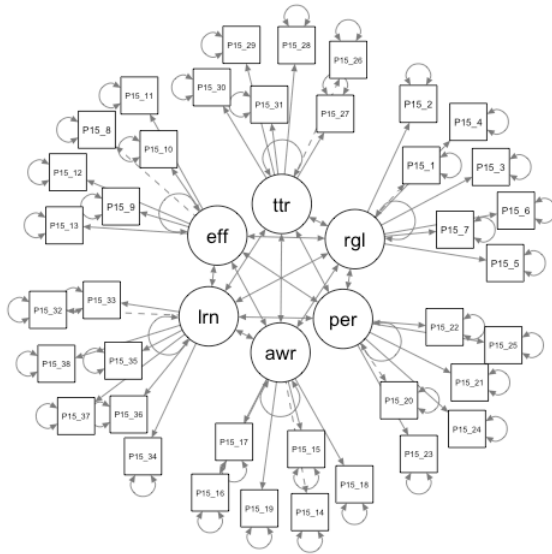
Outcome measure: Students' Socioemotional Learning (SEL)

Five domains in 38 items:

- Self-regulation (7 items)
- Self-efficacy (6 items)
- Social Awareness (6 items)
- Peer connectedness (6 items)
- Tutor-connection relationship (6 items)
- Learning Environment quality (7 items)

Ordinal Scale from 1 to 6, with 1: Strongly disagree to 6, strongly agree.

Measuring Students' Socioemotional Learning (SEL).



Measurement Invariance

SEM Framework requires us to test MI by running a Multigroup Confirmatory Factor Analysis (MGCFA).

- Configural: Invariance of model form (e.g. basic organisation of the factors is supported across groups)
- Metric: Equivalence of the item loadings on the factors (each item contributes to the same construct similarly across groups).
- Scalar: Equivalence of item intercepts.

We used Sex (Female/Male) and Grade (7th/8th) as our comparison groups

Results SEL: Measurement Invariance

MI step	March 2020	March 2022	November 2022
Configural	Met	Met	Met
Metric	Not met	Not met	Not Met
Scalar	Not met	Not met	Not Met

Not met means that when we constrained the item loadings or the intercepts, the

$$\chi^2$$

test comparing the models was statistically significant ($p < 0.05$)

Results SEL: Measurement Invariance

We excluded Heywood cases: implausible factor loadings (standardized) and obtained a shortened CFA:

- Self-regulation: 4 items
- Self-efficacy: 3 items
- Social Awareness: 2 items
- Tutor relationship: 4 items
- Learning environment: 2 items

MI is met for only Nov 2020, but remains unmet for March 2020 and March 2022

Results: IRT

In IRT models, measurement invariance occurs when items exhibit the same item characteristic curves (ICC) across groups of participants or, equivalently, items exhibit the same parameter estimates across groups (Embretson & Reise, 2000)

In practice, this suggests checking for Differential Item Functioning (DIF), but some researchers argue that MI is an intrinsic property of IRT (Rasch, 1980).

Results: IRT

DIF occurs when two subjects of the same ability or knowledge but from different social groups have different probabilities of answering a specific item (correctly). We use the library `difNLR` in R to estimate our results. For ordinal data, there are two ways to model DIF:

- Cumulative Logit Model
- Adjacent Category Logit Model

Here we follow Burkner & Vuorre (2019)'s approach of Cumulative Logit Model since we are not particularly interested in differences between a response level 5 (agree) and 6 (strongly agree).

Results: IRT

The cumulative model is defined as follows:

$$P(Y_{ip} \geq k | X_p, G_p) = \frac{e^{a_{iG_p}(X_p - b_{ikG_p})}}{1 + e^{a_{iG_p}(X_p - b_{ikG_p})}},$$

where k are the outcome categories, and

$$b_{ikG_p} = b_{ik} + b_{DIFG_p}b_{iDIF} \quad (1)$$

with

$$b_{iDIF} \quad (2)$$

as the difference of the difficulty of item i between the reference and focal group

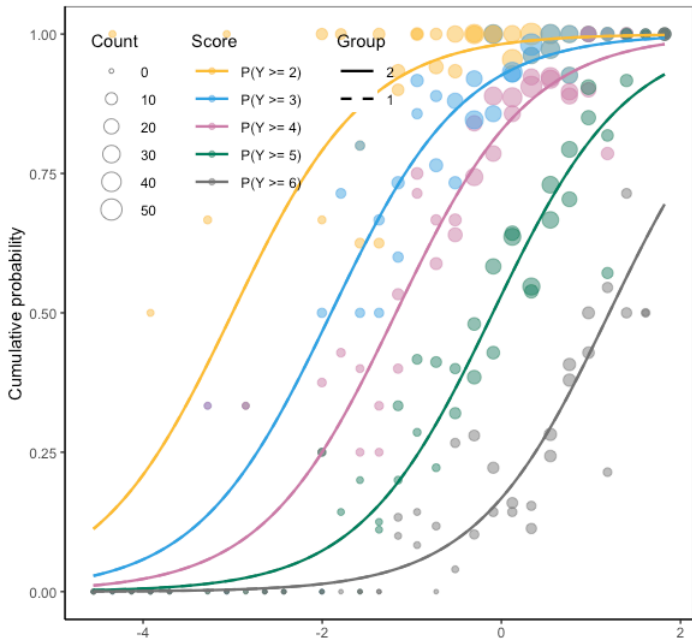
Results with DIF

Scale	Item
Efficacy	"I listen to what people say."
Awareness	"I try to learn about people who are different from me."
Peer	1. "I can wait for what want" 2. "When I don't understand something, the tutor explains it to me until I understand."
Tutor	1. "I complete all my homework even when challenges arise." 2. "Each lesson is explained in several different ways."
Learning	"Students receive instructions on how to complete their classwork"

Self regulation did not have DIF

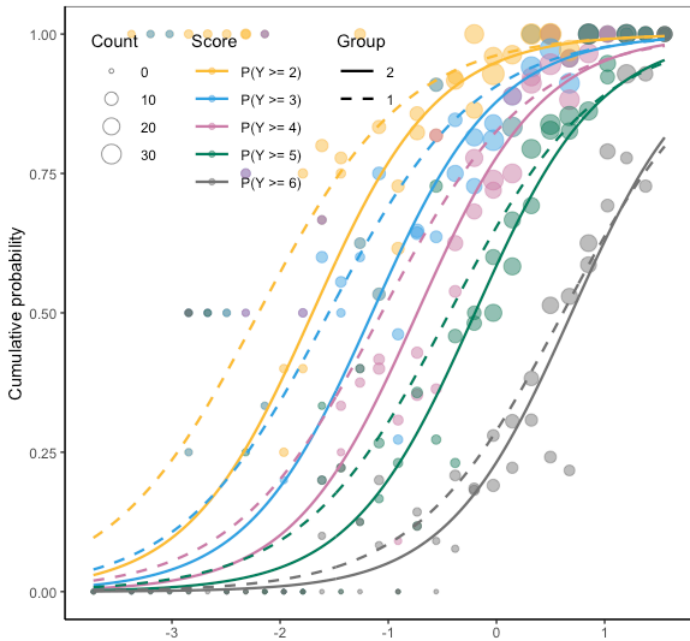
Examples of items with and without DIF

P15_8



Measuring Students' Socioemotional Learning (SEL).

P15_4



Measuring Students' Socioemotional Learning (SEL).

P15_35

