

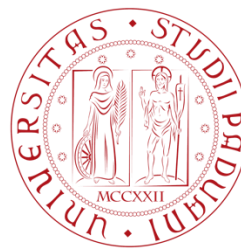
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Design of a test for assessing teamwork and collaborative skills with Competence-based Knowledge Space Theory



Why collaborative and teamwork skills?



*Teaching
And
Learning
International
Survey*

Development
of the test



Teamwork and collaborative skills in teachers

Relationship domain

Effective Communication

- Using supportive, motivating and proactive communication strategies.
- Using active listening techniques.
- Recognizing, interpreting and producing verbal and non-verbal instructions.

Conflict Resolution

- Recognizing type and relevance of a conflict situation.
- Identifying conflict resolution strategies.
- Using negotiating approaches, dealing with others.

Action Planning

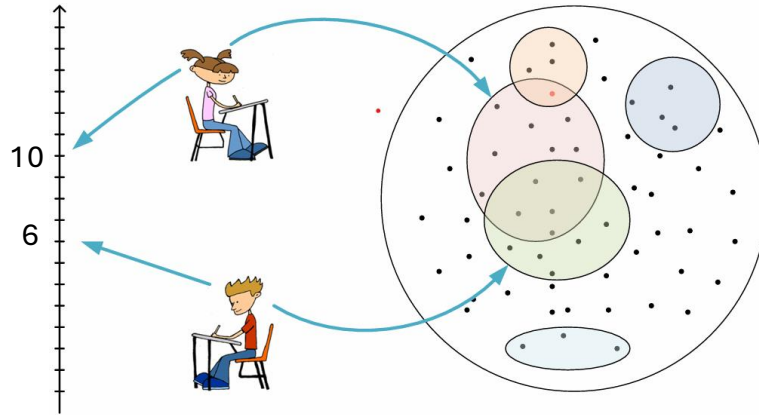
- Identifying a shared objective.
- Identifying and planning action strategies.
- Identifying and establishing roles and tasks equally within the group.

Performance Monitoring and Feedback

- Recognizing the obstacles and errors during groupwork.
- Providing individual and collective feedback.
- Identifying problem-solving strategies

Work Management domain

Traditional approaches
Numerical scores represent the proficiency of a student in a given area



CbKST
Provide a precise description of the set of skills mastered by a student, starting from items' responses



Competence-based Knowledge Space Theory (CbKST)

CBLIM

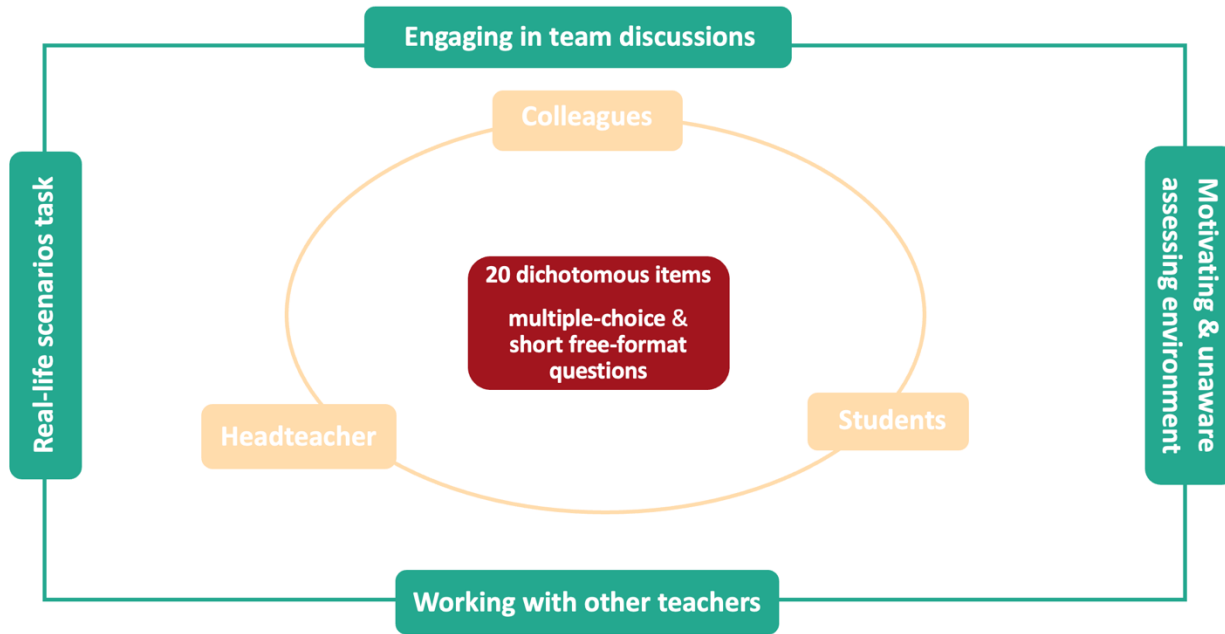
- Absolute goodness-of-fit
- Local identifiability of the model parameters
- Estimates of careless error and lucky guess parameters for each item



Careless error (β_q)

Lucky guess (η_q)

A quick look at the test design



- Individual computer-based assessment
- Conversational agents
- Situated-based assessment

Guarda il video, poi rispondi alla domanda. Se fossi al posto di Mirta, come ges...

Guarda su YouTube

Come lo ha gestito lei, mi sembra un buon modo.

Avrei annotato, man mano, le opinioni degli studenti.

Avrei indirizzato le risposte dei ragazzi verso la direzione che era mia intenzione dare, aggiungendo mie parole/frasi.

Non avrei dato la parola a tutti gli allievi con la mano alzata in modo da gestire meglio i tempi. Power

Examples of a chat-based and video-based item

Progetto Accoglienza

Scegli, fra le alternative proposte, la risposta da inviare.*

Armando
Sto annotando le vostre considerazioni su un foglio condiviso con tutti.

Lia
Io e mia figlia spesso inventiamo storie insieme e secondo me la prima alternativa (storie e racconti) potrebbe essere ideale per i bambini che dalla scuola dell'infanzia arrivano alla scuola primaria.

Armando
La mia classe invece, dopo un'attività in bicicletta, ha illustrato i vari segnali stradali incontrati descrivendo l'esperienza. Quindi sceglierei "Sito urbano" perché abbiamo già del materiale.

Scrivi un messaggio

Va bene Lia, scegliamo la tua proposta.

Sono d'accordo con Armando, in modo tale da avere già del materiale su cui lavorare.

Aldilà delle vostre esperienze personali, io sceglierei la proposta che reputo più interessante.

Potremmo decidere di inventare storie, ambientando le narrazioni in città.

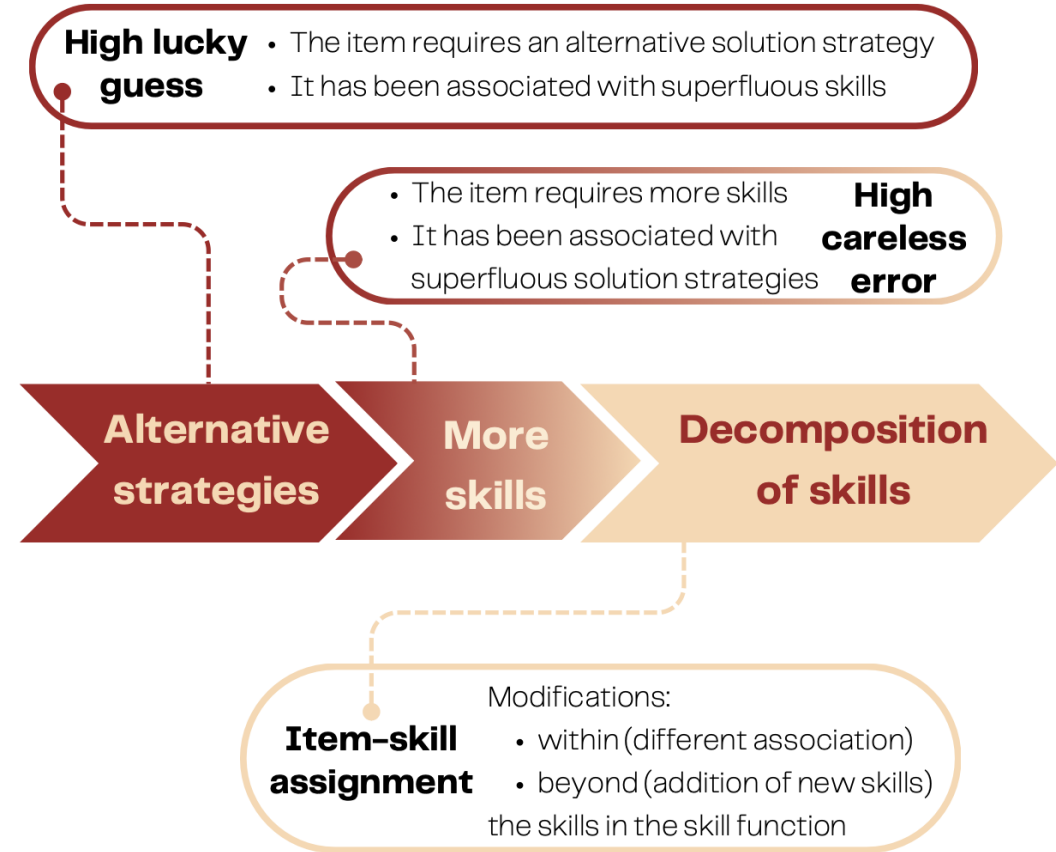
Ok

Powered by Type

Preliminary hypothesized item-skill assignment

I T E M S	Skills				Estimates	
	Effective Communication	Conflict Resolution	Action Planning	Performance Monitoring and Feedback	β_q	η_q
1			X		.21	.46
2	X				.29	.66
3			X		.40	.20
4			X		.05	.75
5		X			.56	.36
6			X		.00	.53
7	X				.16	.27
8		X			.48	.47
9	X				.04	.88
10				X	.21	.03
11	X				.23	.53
12	X				.68	.02
13		X			.17	.51
14		X			.04	.55
15				X	.12	.14
16				X	.14	.81
17			X		.55	.36
18		X			.20	.38
19				X	.24	.60
20				X	.00	.47

Goodness-of-fit: p-value .08



Test validation

CBLIM

Fitting

Identifiability

Parameters

Goodness-of-fit of the model tested using Pearson's chi-square statistic and a parametric bootstrap of 1000 replications (satisfactory if p -value $> .1$)

Interpretation of the **estimates of careless error β_q and lucky guess η_q** parameters for each item (satisfactory if $\beta_q, \eta_q < .5$)

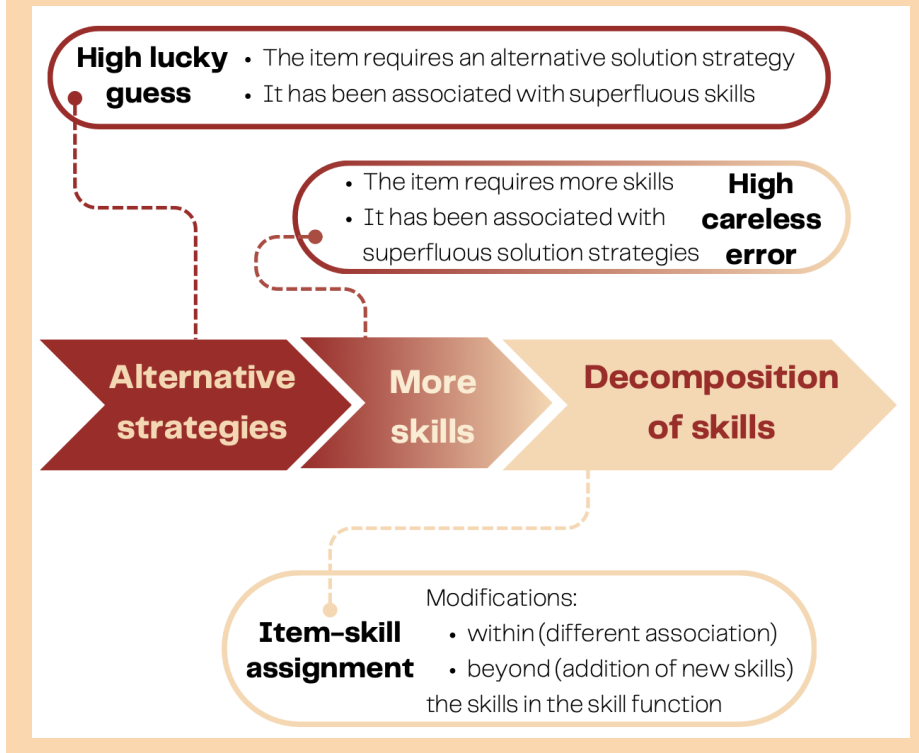
CBLIM estimated on the responses given by 142 pre-primary and primary school teachers to the items (administration by Zoom or free link), by using maximum likelihood estimation method

The **local identifiability** of the model was tested by ascertaining if the item-skill assignment was fully informative and if the Jacobian matrix of the prediction function of the induced BLIM was full rank

New item-skill assignment

Goodness-of-fit: p-value .37

Results



I T E M S	Skills						Estimates	
	Using supportive, motivating and proactive communication strategies	Using active listening techniques	Recognizing type and relevance of conflict situation	Identifying conflict resolution strategies	Identifying and planning action strategies	Monitoring performance and providing feedback	β_q	η_q
1					X		.23	.40
2			X				.00	.54
3					X		.47	.18
4						X	.07	.71
4					X			
5			X	X			.26	.31
6						X	.05	.45
6					X			
7	X						.00	.13
8			X	X			.43	.48
9		X					.04	.52
10						X	.23	.05
11	X						.29	.00
11		X						
12	X	X					.74	.12
13				X			.20	.43
13			X					
14			X				.05	.35
14				X				
15						X	.06	.13
16					X		.10	.68
16						X		
17					X	X	.51	.37
18				X			.21	.36
19					X		.32	.61
19						X		
20						X	.00	.48

It is possible to estimate the probability of the *competence state* (the set of skills an individual masters) of each teacher underlying the item responses

Learning Compass 2030

The importance of **multidisciplinary** in responding to educational needs

Limitation

Small sample size

Future work

Test application

Larger sample size

Final Remarks



A close-up, low-angle shot of a globe. The globe is tilted, showing a map of North America and the Gulf of Mexico. The map is detailed, with state and country names visible. The globe's surface is a mix of green, yellow, and brown, representing landmasses. The background is a solid, vibrant blue. A large, white, sans-serif text message is centered over the globe. The text reads "Thanks for your attention" in a large font, and "Email: federica.morleo@phd.unipd.it" in a smaller font below it. The globe's metal frame is visible at the top and right edges, with some numbers and letters engraved on it.

Thanks for your attention

Email: federica.morleo@phd.unipd.it