The Effectiveness of Conjoint Analysis in Educational Research Fields

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Background

It is a very familiar with and useful way of using average scores especially like as in t-test, analysis of variance and so on. However, for discussing some needs of pupils and their parents in education fields, there is a large limitation of that indicator. That is, how we can use average scores for decision making in provision for pupils and parents as a school policy.(Sanagi, 2001) We can get information using the average scores of pupils' or parents' needs as comparing the scores each other. However, does the difference of averages indicate precisely their needs? Although the results using average scores are useful for interpretation of the data and we can explain the conclusion as a statistical result as objectively, are those statistical results the same as their wishes? In actually, we can see that there are large differences between statistical results and the actual needs of people in many cases. One of the reason why this kind of mismatch occurs is that there is a limitation of using and interpreting statistical averages. We all know that we should surely keep independency of each items of a questionnaire. It is the point that the differences between the statistical outcome and the actual needs occur. We always make our own decision not only to think about one factor but also some other factors at the same time. Sanagi(2001) has focused on this kind of statistical limitation in educational and social science studies and shown a solution as using an alternative statistical way, Conjoint Analysis. In this study, I will explain how useful we can apply conjoint analysis in education studies with a new data by teachers.

Method

Participants
・69 mainstream and special school teachers who have joined a series of seminars to have a special teacher license in Japan

Data collection
・Using two kinds of questionnaires for the analysis :
1) For traditional method, two set of 7 items for an analysis of the evaluation for the needs of "reasonable accommodation" in schools for pupils with physical disabilities
  ・Seven items of each questionnaire consist of two condition:
   A) in case pupils are "low academic skills" and
   B) in case pupils are "high academic skills"
2) Eleven items for a conjoint analysis was consisted of 11 items each item consisted of combined 4 factors of the same elements as traditional items above
3) Data collection had conducted in August 2016

Procedure
1)Traditional method   (see Figure 1)
  Participants were asked items as "What do you think the extent of that teachers should provide a reasonable accommodation as _____."
2)Conjoint Analysis (see Figure 3)
  Using a questionnaire as the same elements for traditional method but using a combination style for conjoint analysis. Each question items for conjoint analysis have consisted of four elements combination as below: (e.g.) A set of Reasonable Accommodation for a pupil with disability as "TA's support" & "PC & Tablets" & "Special desk for Physical disability" & "Time extension at achievement tests." Then, teachers answered for the items like as "I think it is enough Reasonable Accommodation for the pupil."
  Participants answered eleven combinations that were produced by conjoint analysis program.
3) We set two kinds of condition in both case pupils are high and low academic skills in both the questionnaire for a traditional way and for conjoint analysis.
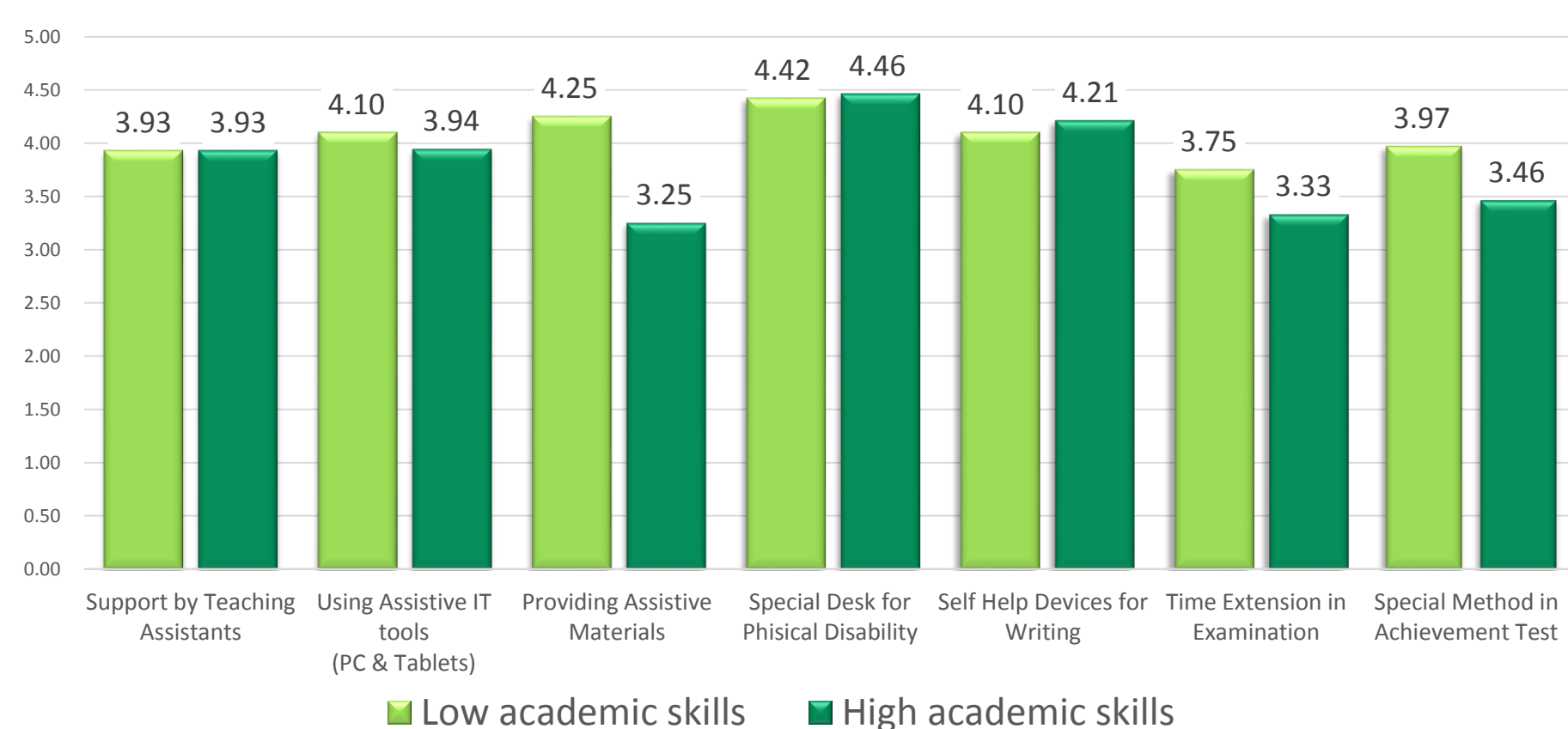
Result & Discussion

Figure 1   Average Scores of Teacher's Evaluation
(What do you think about the needs of "Reasonable Accommodation" for pupils with PD?)

Figure 1, using traditional average scores, shows that the differences between low and high academic skills in the scores of teachers' evaluation about the needs of reasonable accommodation for pupils with disabilities were figured not so clear.
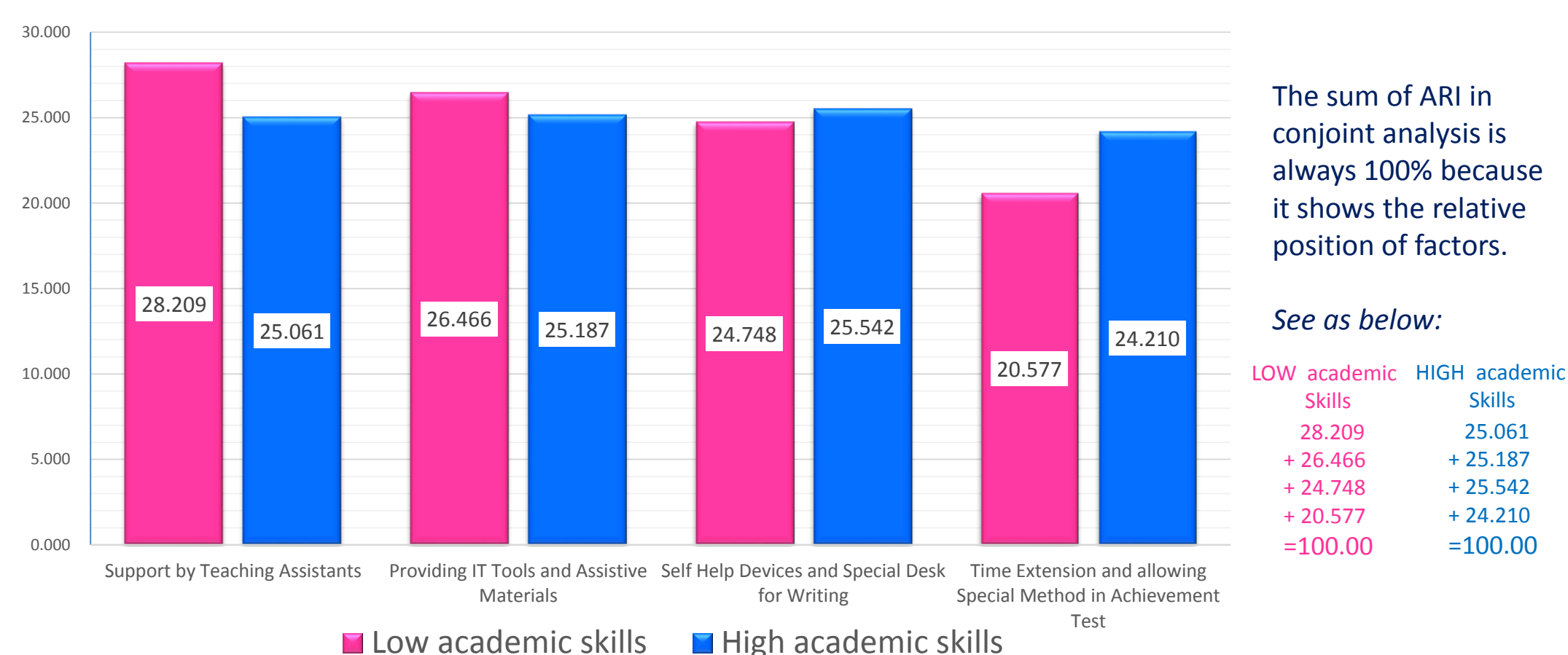
Figure 2   Average Relative Importance (Conjoint Analysis)

The sum of ARI in conjoint analysis is always 100% because it shows the relative position of factors.

See as below:

LOW academic Skills	HIGH academic Skills
28.209	25.061
+ 26.466	+ 25.187
+ 24.748	+ 25.542
+ 20.577	+ 24.210
=100.00	=100.00

Conjoint analysis provides two indicators as a result. One is "Average Relative Importance(ARI)", and the other is "Utility Scores" of each factor. The figure of ARI shows as similar as in traditional average scores. (Figure 2) It seems, at a glance, that there are not so outstanding differences between a traditional way and conjoint analysis in showing the results. However, we can find the crucial difference for showing that what items have negative response by answerers in figure 3 as minus directed bars. That kind of information gives us that decision making by persons always has done in thinking both positive and negative factors. Notwithstanding this fact, we continued to use the typical traditional statistical ways. Do the traditional ways gives us the useful findings along real decision making process by respondents? That is one of the reason why I recommend to use conjoint analysis in educational research for getting useful and real findings.
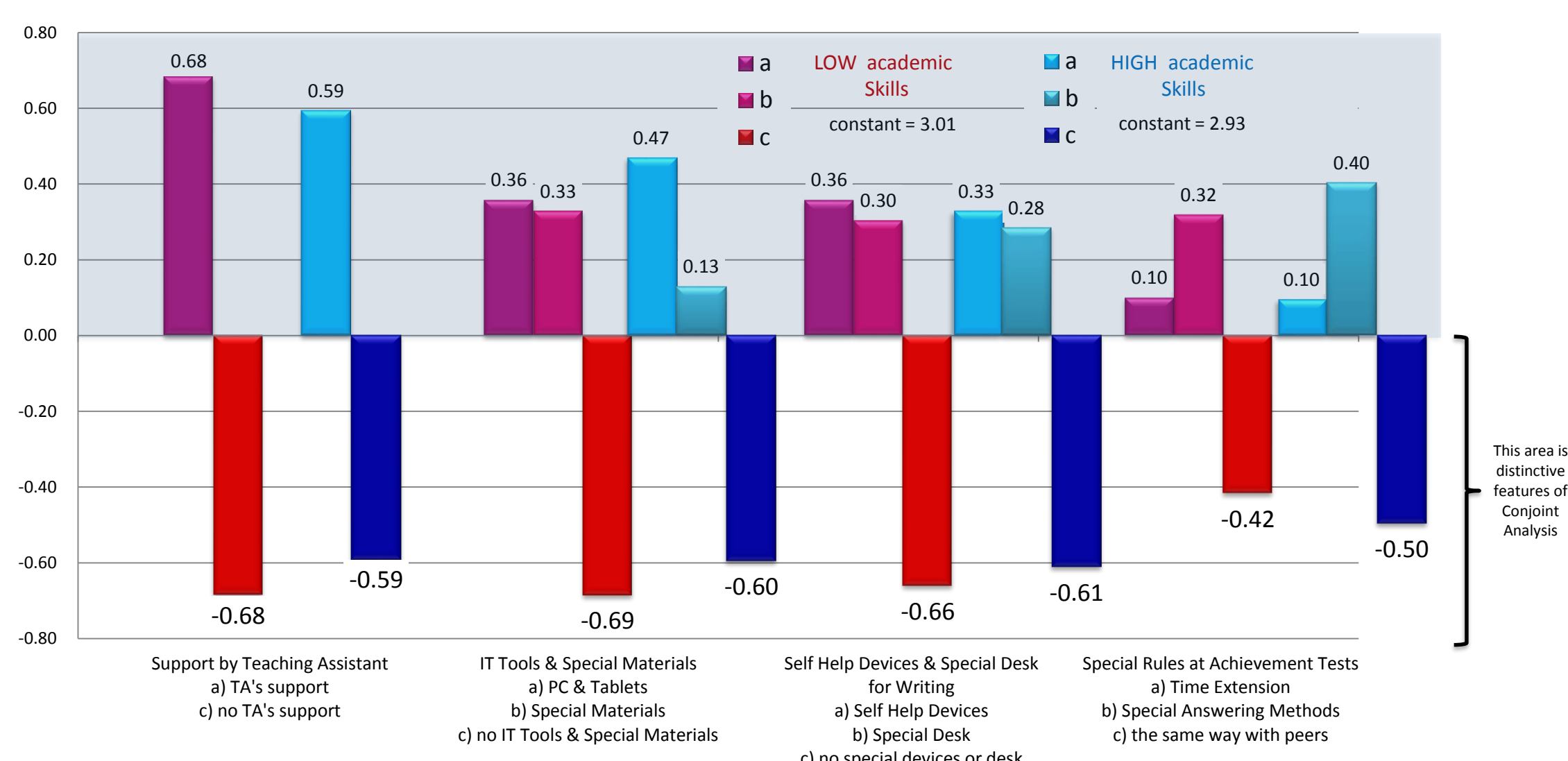
Figure 3   Utility Scores (LOW & HIGH Academic Skills)
- teacher's evaluation for pupils with physical disability -

The bottom part of figure 3 shows what items were estimated as no need to provide their pupils as a reasonable accommodation. That kind of findings was not issued in using traditional average scores. This is one of the useful points of conjoint analysis. We can estimate decision making point of respondents as simulation. That is, we can choose one item from each one factors, and the sum up of the values, then we get the value of the estimation of the combination. It is more real value than the value in case each item was evaluated separately.

Conclusion

How we can use conjoint analysis in our research in education fields?

1) Conjoint analysis does not provide a completely different finding but provide much more useful findings because, as the items in conjoint analysis always were shown as a combination style of factors, respondents were able to think in more real decision making way. Conjoint analysis is useful as a means to supply some findings for precise interpretation of results.
2) Teachers have a tendency to evaluate the decision of providing reasonable accommodations for pupils with special needs in their classroom by condition of academic skills of the pupils, though the Convention on the Rights of Persons with Disabilities had not assumed a condition of pupils' academic skills, high or low. However, as teachers are familiar with treating special needs as to recover academic behinds of pupil with special needs in schools, they seem to do not provide a reasonable accommodation in the case of pupils with both high academic skills and special educational needs.

In the field of educational study, it seems that many researchers seek to conduct their research as "scientific" with using traditional statistical method. The more we make our researches as science, losing more and more findings in real evaluation to answer the questionnaires by respondents, because it easily cut off the other aspects of decision making. Conjoint analysis seems to be the complement of traditional way.
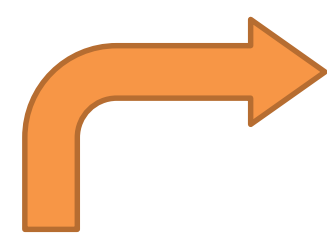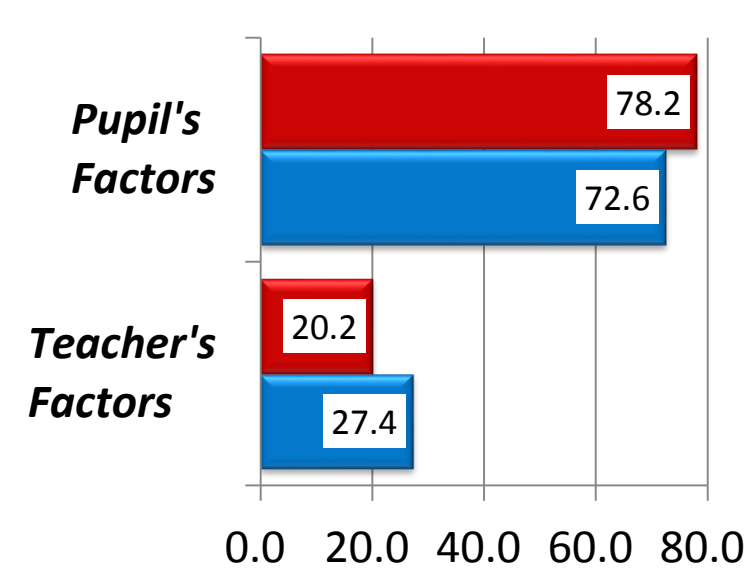
Pupil's Factors — 78.2 / 72.6

Teacher's Factors — 20.2 / 27.4

0.0 20.0 40.0 60.0 80.0

Table 1 Factors and Levels for questionnaire A (Sanagi, 2016a)

Factor 1	(level 1)	make a good effort
(Pupil's Effort)	(level 2)	not make an effort
Factor 2	(level 1)	higher performed than others
(Pupil's Achievement)	(level 2)	as level on others
	(level 3)	lower performed than others
Factor 3	(level 1)	well skilled teacher
(Teacher's Skills)	(level 2)	no skilled teacher
Factor 4	(level 1)	provide enough accommodations
(Reasonable	(level 2)	partially provide accommodations
Accommodation)	(level 3)	not provided accommodations
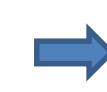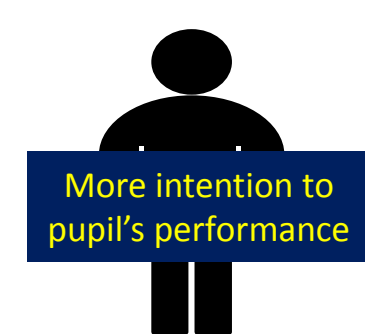
More intention to pupil's performance → More Harmonic image   *But Why?*

Table 2   T-test of clusters about images of inclusive education

		Cluster	N	Mean	Std.Dv.	t	df	sig. (2-tailed)	Effect Size (r)	
Factor 1 Balanced Accordance	Harmonic − Nonharmonic	1	69	4.58	0.55	8.41	80.20	0.000	0.69	Large
		2	54	3.35	0.95					
	Cooperative − Uncooperative	1	69	4.75	0.50	9.06	90.90	0.000	0.69	Large
		2	54	3.72	0.71					
	Equal − Unequal	1	69	4.78	0.48	8.41	72.70	0.000	0.70	Large
		2	54	3.56	0.98					
Factor 2 Familiarity	Cheerful − Dismal	1	69	3.46	0.68	2.50	116.91	0.014	0.23	Small
		2	54	3.17	0.64					
	Intimate − Standoffish	1	69	3.65	0.87	3.24	121.00	0.002	0.28	Small
		2	54	3.15	0.83					
	Sprightly − Tired	1	69	3.72	0.78	3.93	120.85	0.000	0.34	Medium
		2	54	3.22	0.63					
Factor 3 Sensitivity	Keen − Dull	1	69	3.43	0.85	3.81	114.31	0.000	0.34	Medium
		2	54	2.96	0.51					
	Careful − Careless	1	69	3.97	0.86	6.27	120.99	0.000	0.50	Medium
		2	54	3.11	0.66					
	Sensitive − Insensitive	1	69	3.83	0.80	3.91	121.00	0.000	0.34	Medium
		2	54	3.30	0.66					