Showcasing the use of Factor Analysis in data reduction: Research on learner support for In-service teachers

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Introduction of the study

- The research explored learners' perceived quality of support from the university and addressed the question: **What perceptions do distance education in-service teachers have about the quality of learner support delivered to them?**
- A 45 item questionnaire was used to measure various aspects of learners' perceived quality of support. Each question was a statement followed by a five-point Likert scale ranging from strongly disagree to strongly agree.
- Factor analysis involving principal components analysis (PCA) with oblique rotation (direct oblimin) using SPSS Version 23 was used in the analysis.

Meaning of Factor Analysis

- "Factor analysis is a mathematical procedure which reduces a correlation matrix containing many variables into a smaller number of factors or supervariables" (Howitt & Cramer, 1997 p.287).
- **Why factor analysis in this investigation?**

The purpose was to explore the possibility of reducing a large set of 45 variables on learner support to fewer manageable and representative factors (factor analysis discovers latent factors from a variety of related variables).

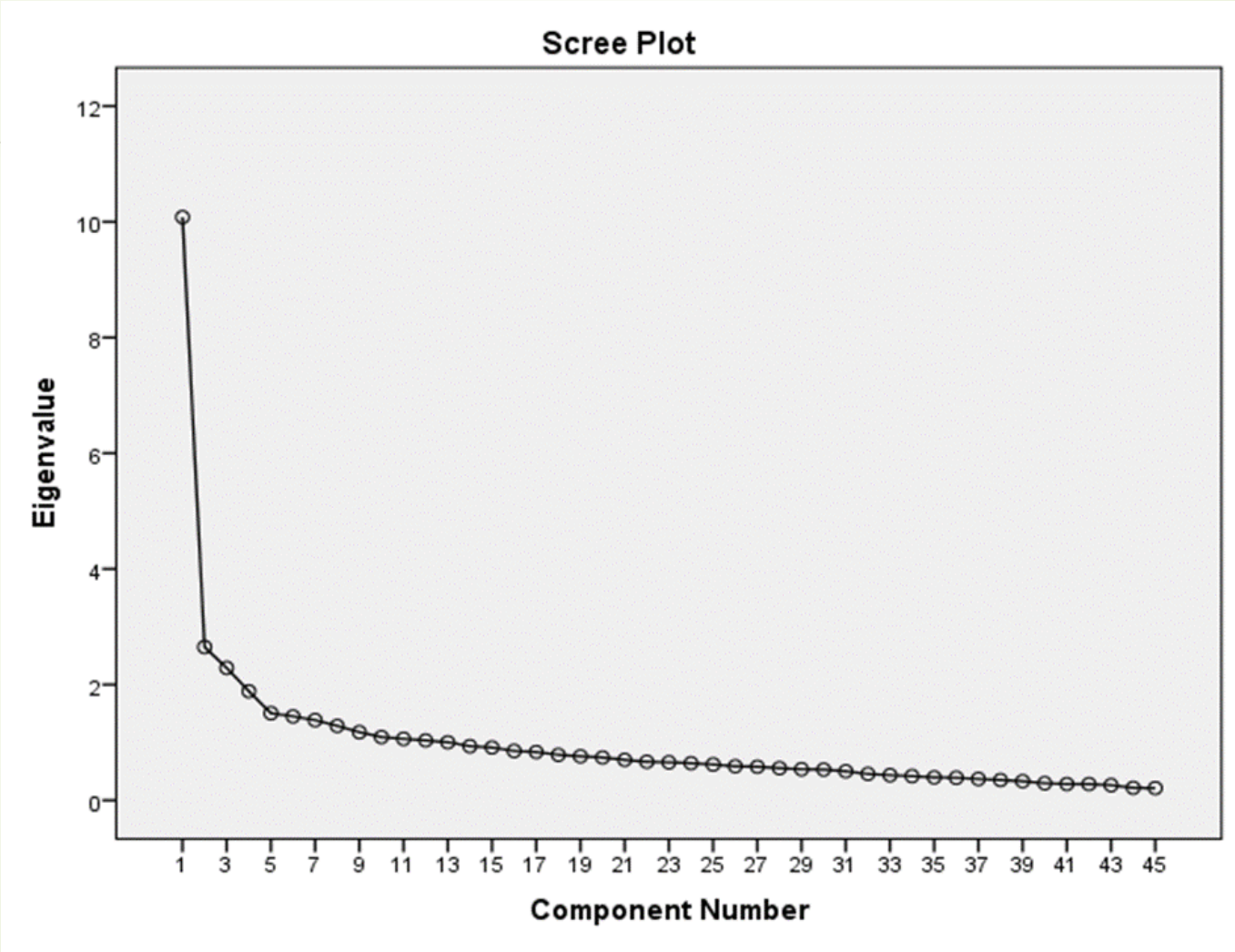
Suitability of the data for Factor Analysis

- Normality was tested using normality plots with tests and histogram, and normal probability plots (Normal Q-Q Plots)- the scores showed reasonably normal distribution.
- The SPSS statistical output revealed straight-line relationships between the variables (linear relationships).
- Multicollinearity was not detected (the determinant of the *R*-matrix was .0008676 which is > .00001
- KMO was .865 (great as per Field, 2009), and is > the recommended minimum value of .6 Kaiser 1970, 1974).
- The Bartlett's Test of Sphericity was statistically significant with $p = .000$ hence $p < .05$ (Bartlett, 1954).
- Content of the factor correlation matrix revealed many high factor loadings above .3

Data reduction – Kaiser's Criterion

	Initial Eigenvalues		
Factor	Total	% of variance	Cumulative %
1	10.081	22.401	22.401
2	2.650	5.889	28.291
3	2.289	5.087	33.378
4	1.886	4.191	37.569
5	1.505	3.345	40.915
6	1.451	3.225	44.139
7	1.386	3.081	47.220
8	1.287	2.861	50.081
9	1.177	2.616	52.696
10	1.093	2.430	55.126
11	1.062	2.360	57.486
12	1.035	2.300	59.786
13	1.004	2.231	62.017

Data reduction – Carttel's Plot



Total Variance Explained of Four Extracted Factors

	Initial Eigenvalues		
Factor	Total	% of variance	Cumulative %
1	10.081	22.401	22.401
2	2.650	5.889	28.291
3	2.289	5.087	33.378
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Internal measure of consistency

Factor	Question number	Cronbach's Alpha (α)
1 Academic advising support	23,43,41,42,21,3,22,1,28,32,9,34,27,24,33,35,11,26	.854
2 Library and technology support	15,31,30,13,10,16,20,14,8	.831
3 Counselling and career support	37,38,36,40,25,44,39,17,29	.803
4 Communication service support	5,12,6,7,45,4,2,18, 19	.704

All constructs produced a significant reliability with Cronbach's alpha > .7, which should be the minimum for a factor to be retained for further analysis and decision making based on the rule of the thumb (Field, 2009).

Concluding remark

- Using factor analysis statistical technique, the 45 initial variables were reduced to 4 factors showing learners' perceived quality of support from the university. These 4 factors generated quantitatively were later explored in the field using qualitative methods.

Thank you for your active

Listening.