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Factorial Structures of Desirable Teaching Behaviours as Perceived By Humanities Teachers: A Q-Methodology Study

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ABSTRACT: *It* is a technique based study in which Stephenson's Q-Methodology has been applied to find the factorial structures of teaching behaviours exhibited by teacher at secondary stage. The methodology is one of the best techniques for objective assessment of subjective concepts as one under investigation. The procedure involves sorting of statements regarding teaching behaviours on a seven points desirability scale (most desirable to least desirable) according to a symmetric distribution of seven piles of 3, 9, 15, 21, 15, 9, 3 cards. Scoring involves weightage of 7 to 1 for items in the piles most desirable to least desirable. The scores are used to find interpersonal correlation matrix followed by principal components factor analysis with Varimax rotation. The factors of persons so obtained are used to find factors of items using Sontag's array technique. Array making involves calculation of weighted scores for items, summed together for all persons in the factor (called factor score) and rank ordering these to get the original Q-distribution. The first three piles constitute the most desirable behaviours. In this way eight factors of science classroom teaching behaviours have been identified. These factors constitute the constructs of the concept desirable classroom teaching behaviours for humanities teachers at secondary stage.

***KEYWORDS*:** *Factorial structure, Desirable teaching behaviours, Q-methodology*

I. INTRODUCTION

Social scientists have always struggled to develop objective and reliable tools for assessment of subjective concepts related to aesthetic and literary ideas. There is very little agreement among artists about the quality (superiority/inferiority) of the paintings, poems, theatrical performance and the like. This is also very much true for assessment of quality of teaching or defining quality teaching. Q-Methodology is used to solve such problems and at the same time provides objective expression of the subjective responses obtained from the participants involved in investigation. The technique is small sample based and is based on the premise that such samples/groups also exist at other places in the universe.The best idea of application of Q-methodology is that we analyse the perceptions of the sample which is directly involved in the process. Here we have taken teachers as the participant to assess what they consider as desirable teaching behaviours. Other option for sample could be students, administrators, educationists and the like.

II. Q-METHODOLOGY

Q-methodology has been devised by Stephenson "to characterize a set of philosophical, psychological, statistical and psychometric ideas oriented to research on the individual" (Stephenson, 1953). It is a method of Q-sorting which calls for a person to rank order a set of stimuli according to a well defined rule (here desirability). The Q-sorting is done by using a set of objects, behaviours or statements as per instruction or defined rule. An individual is asked to sort them into fixed number of piles with fixed number of stimuli based on a normal, symmetric or quasi symmetric distribution we call it as Q-distribution

IPSATIVE VERSUS NORMATIVE MEASURES

Normative measures are generally used with tests and scales. An individual is free to choose any of the alternatives out of five/seven alternatives if administration is done on a five/seven point scale. On the other hand ipsative measure (as used by Q-methodology) involves forced choice procedure of placing fixed number of items into fixed number of categories using a specific criterion. It fixes the available choices rather than open one.

UNSTRUCTURED AND STRUCTURED Q-SORT

An unstructured Q-sort is a set of items assumed without specific regard to underlying factors i.e. no specified (pre-decided) factors are kept in mind while framing the items of the measure. On the other hand structured Q-sort consists of items or statements framed or collected with specific regard to the underlying structure of factors

(or variables). The main purpose of a structured Q-sort is to develop a theory or theoretical structure. Also it intends to test already existing theory or constructs. In present investigation we have chosen to use unstructured Q-sort.

R-METHODOLOGY

R-technique is concerned with co- relational analysis of tests. In R-methodology tests and scales are administered on samples of persons which are then scored objectively using normative methods of scaling. Purpose of R-methodology is to study individual differences through tests or scales which measure their abilities.

III. Q-METHODOLOGY VERSUS R-METHODOLOGY

Q-methodology uses ipsative method of measurement while in R-methodology data are obtained on normative measure. Factor analysis of inter-person correlations is done in Q-methodology and classification of statements is derived by manipulation of factor arrays. In R-methodology factorial structure is obtained by factor analysis of inter-item correlations.

IV. STEPS OF Q-METHODOLOGY

a) Working out a "concourse" to frame statements (developing a Q-Set);
b) Samplingof (participants/ persons);
c) Q-Sorting uses ipsative measures;
d) Finding the inter-Person correlations;
e) Factor analysis to find groups of persons;
f) Working out underlyingstructure of items

OBJECTIVES OF THE STUDY

- To develop aunstructured Q-sort of desirable teaching behaviours for teaching humanities subjects.
- To develop inter-person correlation matrix.
- To determine groups of persons using principal components method of factor analysis using Varimax rotation.
- To calculate weighted scores, factor scores and array value to get original Q-distribution.
- To investigate the factors underlying the measure and to dub the factors according to the nature of the attitude items.

HOW DOES PRESENT INVESTIGATION PROCEED?

The concourse is developed by using a number of tools and sources like observation, interview, and literature on the subject of the study. The items are then written on cards for the purpose of sorting by the respondents. The sorting is done on the ipsative scale in seven piles of distribution of 3, 9, 15, 21, 15, 9, 3 cards. Scoring is done from 1 to 7 for all items in the piles from least desirable to most desirable continuum. Data so obtained is then subjected to Q-type factor analysis i.e. finding inter-person correlation and forming groups of persons. Q-arrays are then used to work out the factorial structure of the items for the purpose of interpretation. In order to find items from factor of persons Sontag's Q- array technique has been used, which involves calculation of weights, weighted scores, and calculating factor scores or Q-values.
Calculation of weights of persons in respect of group

$W_j = a_j(1-a_k^2)/a_k(1-a_j^2)$
W_j= weighted score of person j
a_j= loading of person j
a_k= the lowest loading in the group of persons which isused to compute factor array

Calculation of weighted scores of items
$W=Z_j * W_j$, where Z is standard score for person j

Calculation of Factor Scores
$W_1+W_2+W_3\ldots\ldots\ldots\ldots\ldots+W_n$= factor score for a given item

Then teaching behaviours are rank ordered according to factor scores. The highest factor score is found to be 7 and others calibrated accordingly, these are called array values. Thus original quasi normal distribution on desirability scale from 7to1 is obtained.

Q-TYPE FACTOR ANALYSIS

The data derived on Q-sorts of 75 teaching behaviours of 60 humanities teachersare subjected to analysis. A Matrix of inter-person correlations for humanities teachers (60x 60 matrix) is subjected to Principal components method of Factor analysis. The computations are performed on a computer using SPSS-16 software programme. Twenty two factors (factors with Eigen values>1) has been obtained from available data. The 22x60 matrix is then subjected to Varimax rotation to obtain an easily interpretablefactorial structure. The finally rotated matrix is then subjected to interpretations.

INTERPRETATION OF FACTORS OF PERSONS

It was easy to interpret an eight factor solution of persons. The persons with high factor loadings were retained in each of the eight factors. Table1 shows the number of persons assigned to each of the eight factors so obtained.

TABLE 1: Number of Persons on the Eight Factors

Factor	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Number of Persons (Humanities Teachers.)	6	6	6	7	5	5	4	4	43

It is worth mentioning here those factors with three or less than three persons have been rejected and the persons in those factors weretried to be retained in factors on which they had loading next to the highest. Loadings of persons on respective factors are not be shown here, however for demonstration sake it is shown for factor I in table 2

TABLE 2: Factor Loadings of Six Humanities Teachers for Factor I

Sr. No.	**Teachers**	**Factor Loadings**							
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1.	T41	.767	.126	.024	.105	.112	-.122	.060	.018
2.	T44	.749	-.157	.121	-.136	-.105	-.038	.114	-.029
3.	T43	.663	.297	-.132	.218	-.003	.093	.096	.071
4.	T46	.620	-.004	.054	-.043	.020	.217	-.104	-.073
5.	T12	.446	-.013	.227	.146	.113	.120	.132	.034
6.	T27	.304	.246	.025	.057	.224	.109	.166	.003

Using array technique as described array values have been calculated for each of the items in all the factors. Due to paucity of space all calculations are not presented here, however, for demonstration sake Array values and corresponding Q-distribution are shown ahead for factor 1.

TABLE 3: Rank ordered Array values of 75 Behaviours for Factor – I

Item No.	Factor Scores in Order	Array Value	Item No.	Factor Scores in Order	Array Value	Item No.	Factor Scores in Order	Array Value
10	29.3	7	72	5.7	5	33	-6.0	3
59	28.0	7	49	5.4	5	57	-6.5	3
51	26.7	7	38	5.1	4	23	-6.9	3
58	24.8	6	6	5.0	4	61	-8.0	3
37	24.3	6	28	4.8	4	68	-8.3	3
25	23.8	6	19	3.8	4	43	-9.3	3
39	23.8	6	7	3.2	4	44	-9.5	3
64	21.6	6	53	2.7	4	36	-10.8	3
47	19.2	6	41	2.4	4	70	-11.1	3
74	16.7	6	18	2.3	4	50	-11.2	3
50	16.2	6	2	1.8	4	30	-11.8	3
31	15.2	6	24	1.3	4	32	-12.1	3
46	13.5	5	73	0.6	4	34	-16.3	3
26	10.8	5	71	0.5	4	75	-16.9	2
1	10.4	5	69	0.2	4	66	-17.6	2
17	10.3	5	29	-0.7	4	52	-17.8	2
12	8.5	5	45	-0.8	4	54	-17.8	2
4	8.3	5	13	-2.3	4	16	-18.3	2
11	8.3	5	60	-2.7	4	40	-23.2	2
21	8.1	5	3	-2.9	4	35	-23.7	2
27	7.3	5	15	-3.0	4	22	-23.9	2
67	6.6	5	8	-4.3	4	14	-25.2	2
20	6.5	5	55	-5.4	4	63	-25.4	1
56	6.5	5	9	-5.7	3	48	-26.0	1
62	6.4	5	65	-6.0	3	42	-28.7	1

75 Desirable Teaching Behaviours Placed In Original Q – SortDistribution

Factor – I of Humanities Teachers

Most Desirable						Least Desirable
10	58	46	38	9	75	63
59	37	26	6	65	66	48
51	25	1	28	33	52	42
Score 7	39	17	19	57	54	Score1
	64	12	7	23	16	
	47	4	53	61	40	
	74	11	41	68	35	
	50	21	18	43	22	
	31	27	2	44	14	
	Score 6	67	24	36	Score 2	
		20	73	70		
		56	71	5		
		62	69	30		
		72	29	32		
		49	45	34		
		Score 5	13	Score3		
			60			
			3			
			15			
			8			
			55			
			Score 4			

The factor structure of desirable teaching behaviours for the purpose of interpretation have been obtained by selecting the top three piles with new Q-sort values (7, 6 and 5 in order from the most desirable end) in each factor. Consequently eight factors each having 27 items are obtained. Items then checked to find out the items, which occurred in more than one factor. Items common to two or more factors have been included in only the factor in which it found its place by virtue of its highest array value. Eight factors solution has bee finally obtained and factors have been dubbed according to nature of items described ahead.

Description of factors of classroom teaching behaviours

TABLE 4: Factor – I: Positive Approach

Sr. No.	Array Value	Item No.	Item
1.	7	10	Proceeds in his teaching from simple to complex.
2.	7	59	Teaches time management.
3.	7	51	Makes the students follow the rules and regulations of the institution.
4.	6	25	Uses positive approach to maintain discipline.
5.	6	47	Evaluates the classroom work of the students as objectively as is possible.
6.	5	12	Stimulates the endeavours of the students.
7.	5	21	Properly supervises learners' performance for constructive feedback.
8.	5	27	Shows sincere concern by not doing things which trouble the students.

TABLE 5: Factor – II: Subject Matter Presentation

Sr. No.	Array Value	Item No.	Item
1.	7	74	Shows mastery of the subject matter in his teaching.
2.	7	37	Presents the subject matter in a well organized manner.
3.	6	36	Gives references of books and journals to inculcate study habits.
4.	6	46	Teaches the students to be active participants.
5.	6	19	Avoids the use of corporal punishment.
6.	6	45	Teaches the subject matter through innovative methods.
7.	5	38	Practices new methods and techniques fornewly introduced subject-matter.
8.	5	15	Uses appropriate teaching learning materials to enhance learning.

TABLE 6: Factor – III: Motivation for Progress of Students

Sr. No.	Array Value	Item No.	Item
1.	7	11	Motivates the students to ask questions.
2.	7	35	Declares the objectives of teaching the subject matter well in advance.
3.	7	6	Displays respect for the personality of the student.
4.	6	31	Takes personal interest in the progress of his students.
5.	6	60	Maintains cumulative record of students' performance.
6.	6	57	Assigns responsibilities to the students.
7.	5	23	Encourages creative solutions to problems assigned to thestudents.
8.	5	5	Helps the students in making rational planning for their future.

TABLE 7: Factor – IV: Values and Norms

Sr. No.	Array Value	Item No.	Item
1.	7	26	Inculcates self discipline.
2.	7	24	Aims at providing value based education.
3.	7	39	Reinforces the habit of regularity among the students.
4.	6	9	Inculcates the value of quality education norm of national prosperity index.
5.	6	71	Students learn to think from the teacher
6.	5	62	Plans values before conducting curricular activity.
7.	5	44	Introduces experimental practices to refine observations ofthe students.
8.	5	43	Inculcate rationalism through his subject teaching

TABLE 8: Factor – V: Democracy in Classroom Teaching

Sr. No.	Array Value	Item No.	Item
1.	7	64	Involves the students in classroom discussion.
2.	7	75	Is tolerant about the mistakes of the students.
3.	7	58	Encourages attentive listening in the class.
4.	6	69	Keeps the learning process close to the learner by creating new learning situations to make them enthusiastic.
5.	6	48	Encourages the students to work for removing the social problems.
6.	6	68	Consistently encourages cultivating zeal for understanding things.
7.	5	41	Is definite in purpose to develop will to learn.
8.	5	73	Assigns functional (activity type) homework to students.

TABLE 9: Factor – VI: Concern for Students

Sr. No.	Array Value	Item No.	Item
1.	7	20	Teaches courtesy behaviour.
2.	7	50	Handles sensitive matters tactfully.
3.	6	22	Encourages the students to try to solve the problems themselves even in case of urgency.
4.	6	72	Encourages the students to take initiative.
5.	6	49	Meets the parents to apprise them of the progress of their wards.
6.	6	17	Carefully observes the individual students and finds out best possible time to help them learn.
7.	5	18	Gives clear and concise assignments.
8.	5	55	Teaches intelligent use of things concerned with students.

TABLE 10: Factor– VII: Pragmatic Approach

Sr. No.	Array Value	Item No.	Item
1.	7	4	Motivates the students to face reality rather than withdrawing from it.
2.	6	63	Rather than limiting his teaching to his own subject the teacher nourishes students' desires to develop proper understanding.
3.	6	8	Advocates moral leadership requiring disposition to do the right thing.
4.	6	56	Shares new knowledge with the students to create interest among them.
5.	6	61	Follows democratic practices.
6.	5	3	Guides the students through new experiences.
7.	5	33	Uses the environment intelligently for guiding learning experiences of the students.
8.	5	29	Takes advantage of student awareness about recent developments in the subject in planning lessons.

TABLE 11: Factor – VIII: Stimulating Teaching

Sr. No.	Array Value	Item No.	Item
1.	7	70	Takes interest in solving personal problems of the students.
2.	6	66	Stimulates reflective thinking among the students by reinforcing students' responses.
3.	6	34	Uses proper measuring tools.
4.	6	67	Uses innovative techniques in his presentations.
5.	6	1	Plans the subject matter according to the intellectual level ofthe students.
6.	5	14	Is very sensitive in recognizing the situations when the students have a high degree of mental set (readiness tolearn) so that they may be motivated.
7.	5	13	Stimulates accuracy of facts.
8.	5	42	Endeavors to elevate young minds through control of senses.

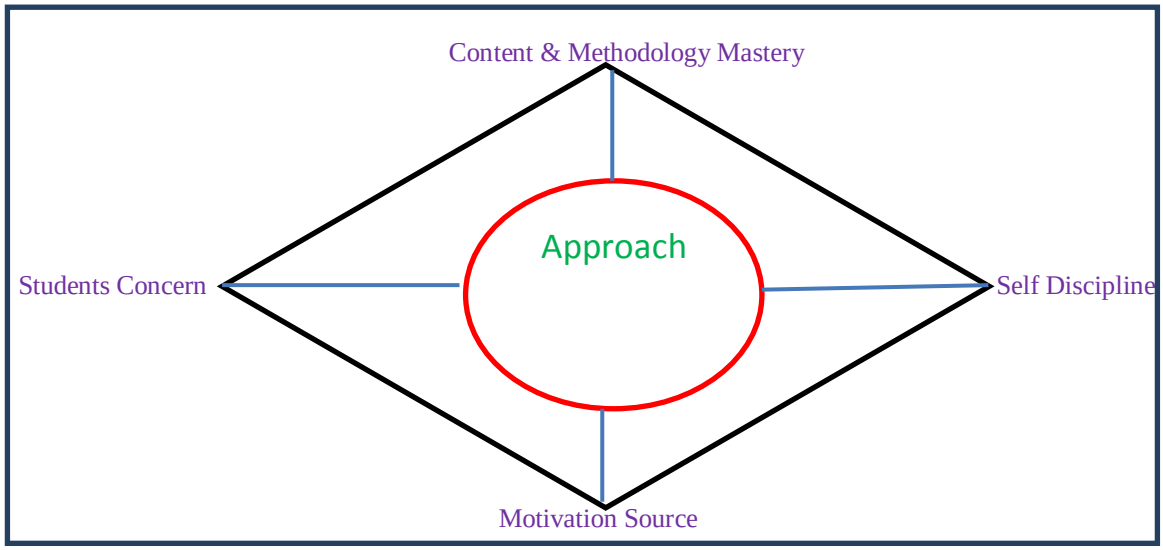
If we closely analyse the results obtained and put the factors in the categories we obtain table 12. Actually it is an attempt to reduce the factors number to observe teaching behaviours is concrete form.

TABLE 12: Factors and possible categories

Factor number	Factor name	Category
Factor – I	Positive Approach	Approach
Factor – II	Subject Matter Presentation	Content and Methodology Mastery
Factor – III	Motivation for Progress of Students	Motivation Source
Factor – IV	Values and Norms	Self Discipline
Factor – V	Democracy in Classroom Teaching	Approach
Factor – VI	Concern for Students	Students Concern
Factor– VII	Pragmatic Approach	Approach
Factor – VIII	Stimulating Teaching	Approach

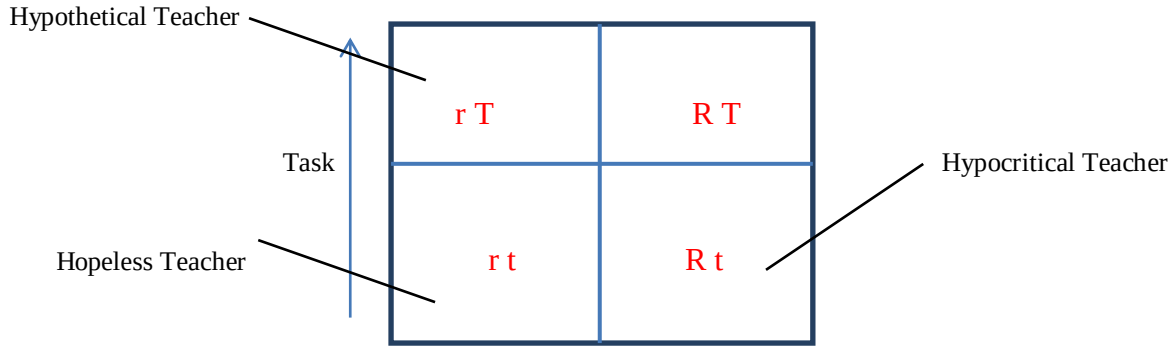
Table reveals that humanities teachers perceive teaching behaviours as blend of appropriate approach, showing student concern, maintaining self discipline and exhibiting content and methodology mastery. However, it is clear that appropriate approach is central to the spirit of teaching behaviours for humanities teachers. This can be represented mathematically and pictorially as shown below.

Teaching behaviours = 4(Approach) + (Students concern) + (Self discipline) + (Motivation Source) + (Content & methodology)



Insyntheticsense we can say that teaching behaviours related to self discipline, student concern, motivation and content & methodology mastery must have a spirit of positive-stimulating-pragmatic-democratic approach. Further factors students concern, self discipline and motivation source can be combined to call it RELATION (with students) dimensionand content and methodology mastery may be termed as TASK. Interaction of these dimensions leads to following combination.

~~Relation~~ → Ideal Teacher



r T =Hypothetical Teacher: a teacher who claims to be best at task performance without having good relations with learners is not a real premise.

R t = Hypocritical Teacher: a teacher who claims to be having best of relation with learners, but at the same time poor at task performance is a hypocrite.

r t= Hopeless Teacher: if a teacher has poor relation with learners and at the same time is poor task performer is nothing but a hopeless teacher.

R T = Ideal Teacher: a teacher is really a teacher when s/he has best of relation with the learners and at the same time performs well on the assigned task.

CONCLUSIONS AND EVALUATION OF THE STUDY

- Q-methodology has been found to be an effective and perhaps better than R-methodology for finding factorial structure of subjective concepts like teaching behaviours. Unstructured Q-Sort worked well with Q-Methodology for the present study.
- There are at least eight factors running through the factor structure of teaching behaviours of senior secondary school humanities teachers. These are further reduced to fivefactors in which approach of teaching is a dominant factor.
- Leaving aside Approach as an essential factor, reaming four factors can be further combined to reduceinto two dimensions called Relation and Task. Finally, combination of these two dimensions results in four kinds of teachers namely Hypothetical Teacher, Hypocritical Teacher, Hopeless Teacher and Ideal Teacher.
- An ideal teacher's behaviours must be directed to build Relation with learners and perform best on Task (subject mastery and methodology of presentation)

SIGNIFICANCE OF THE STUDY

The study can contribute to theorize teaching behaviours which when practiced results in effective humanities teaching. It is another approach for building a repertoire of ideal humanities teaching behaviours. Factors can be used as measures for further studies.

FURTHER LEADS FOR THE STUDY

Similar study can be framed for finding factorial structure of Scienceteachers. A comparison between two factorial structures can also be a worthwhile investigation. A comparison between factorial structure developed through Q and R methodologies can also be a good proposition to study.

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