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DEVELOPMENT AND VALIDATION OF PEDAGOGICAL CONTENT KNOWLEDGE TEST FOR PROSPECTIVE TEACHERS

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Abstract

Pedagogic content knowledge was first proposed by Shulman (1986) and developed with colleagues in the knowledge growth in teaching project as a broader perspective model for understanding teaching and learning. Pedagogic content knowledge identifies the distinctive bodies of knowledge of teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems or issues are organized represented and adapted to the diverse interests and abilities of learner, and presented foe instruction. The PCK test has 3 dimensions namely content knowledge, curriculum knowledge, and pedagogical knowledge. The initial tool consists of 60 items and final tool has 42 items. It is a objective type questions. The reliability and validity of the tool was also found out.

Introduction

Pedagogic content knowledge identifies the distinctive bodies of knowledge of teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems or issues are organized represented and adapted to the diverse interests and abilities of learner, and presented foe instruction." Pedagogic content knowledge is the category most likely to distinguish the understanding of the content specialist from that of the pedagogue." (Shulman, 1987). Pedagogic content knowledge was first proposed by Shulman (1986) and developed with colleagues in the knowledge growth in teaching project as a broader perspective model for understanding teaching and learning(e.g., Shulman & Grosman, 1988).This project studied how novice teachers acquired new understandings of their content, and how these new understandings influenced their teaching.

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These researchers described Pedagogic content knowledge as the knowledge formed by the synthesis of three knowledge bases: subject matter knowledge, pedagogical knowledge, and knowledge of context. Pedagogic content knowledge was unique to teachers and separated, for example, a science teacher from a scientist.

Out of the discussion with the experts the investigator identified three dimension of Pedagogic Content Knowledge Test. They are

i. Content Knowledge
ii. Curriculum Knowledge
iii. Pedagogic Knowledge

Content Knowledge

Content knowledge refers to the knowledge in the particular content. For example if a high school physics teacher teaches a topic teacher should be aware of the what all content is there in the topic and should have a deep knowledge in the topic concerned. This knowledge is a primary need for teaching because it is a base of teaching. Without a sufficient knowledge in the content a teacher cannot succeed in his/her teaching carrier.

Curriculum Knowledge

Curriculum knowledge is the knowledge about the science curriculum. The knowledge of curriculum is another important aspect. It includes the method of teaching, number of hours required for teaching topic .The knowledge of curriculum help the teacher to plan the time. If some lesson requires large number of periods she/ he can understand that it is a important chapter.

Pedagogical Knowledge

Pedagogical knowledge is deep knowledge about the processes and practices of teaching and learning, encompassing educational purposes, goals, values, strategies, and more. This is a generic form of knowledge that applies to student learning, classroom management, instructional planning and implementation, and student assessment. It includes knowledge about techniques or methods used in the classroom, the nature of the learners' needs and preferences, and strategies for assessing student understanding. A teacher with deep pedagogical knowledge understands how students construct knowledge and acquire skills in differentiated ways, as well as how they develop habits of mind and dispositions toward learning. As such, pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom.

Construction of the PCK Test

The steps in the construction of the test are listed below:

I. Planning of the test
II. Preparation of the test
III. Item analysis
IV. Finalization of the test

Planning of the test

For any task to be successful, careful planning is an important step. For the development of the test the investigator planned to construct an objective type test with all items an objective type questions. The numbers of the test item were fixed as 60.

Pilot testing

A pilot test was conducted to examine the time required for the test to see whether there exists any ambiguity in the item construction. The test was administrated to 25 prospective teachers of ISS Training College Perinthalmanna. All were given sufficient information about the test and were asked to follow the instruction carefully and accurately. They were allowed to ask any doubt while answering. The investigator was able to rectify and correct the errors and also the difficulties found by the prospective teachers through careful study of the response sheet. So the investigator was able to identify certain drawbacks of test items and corrected them. The average time taken by the prospective teachers was fixed 1 hour to complete the response sheet. Thus the test was ready for try out and printed on a booklet form along with the necessary instruction. A separate response sheet was also printed.

Tryout and finalization of the test

The draft test consist of 60 objective type test item were tried out on a representative sample of 100 prospective teachers from palakkad district. The sample was purposefully selected from the prospective teachers.

After obtaining the permission to collect data required for try out the investigator contacted the head of the different colleges. The purpose of the test is to assess the pedagogic and content knowledge of prospective teachers. The chapters of 8th and 9th standard physics were selected for the test.Eventhough test was provided with all the necessary guide lines about the test, additional oral information was given by the investigator so that prospective teachers may respond to the test properly. The investigator then collected filled up response sheets from the respective teacher.

Scoring was done with the help of the scoring key. For the correct response a score of '1' was given for the wrong response a score '0' was given. The score of the individual items were summarized to give total score of the prospective teachers. For the tryout session incomplete response sheets were rejected

Item analysis

According to Ebel (1972) the analysis of the teachers response to total items is called item analysis. It was done to know whether each item prepared by the investigator has the required quality. The following steps were done as suggested by Ebel and Frisble (1991).The quality of a test depends upon the individual items of which it is compared so it is necessary to analyze whether each item useful for the purpose to which it is being constructed. It is done as per procedure suggested by Ebel and Frisble (1991).Garret (1976) is in the view that "the adequacy of the test whether its purpose depends on the case with which an item of the test has been chosen.

a. Determining upper and lower group of the sample

The investigator arranged the selected 100 response sheets in the order of high to low .Then separate two such, an upper group consisting of 25% of the total group who received the highest score on the test and lower group consisting of an equal number from those who received lowest scores. In the present test 25 subjects on the top and

25 on the lowest were taken as upper and lower group for item analysis.

b. Determining the difficulty index

The difficulty index (DI) of the test affects the ability of the group responding to them. Item difficulty has a profound effect on both the variability of test score and the precision with which test scores discriminate among different groups of examinees. The effect of difficulty on the variance of the test score is partially obvious when DI values are extreme.

The test item with difficulty value '0' and '1' may affect the test mean, but have no effect on the test reliability and validity or no decision that are based upon test scores.

The DI of an item is the percentage of students, who responded to it correctly. The following formula suggested by Ebel (1972) was used to calculate the difficulty index of each item

Difficulty index DI=U+L/2N

U=the number of correct response in upper group

L= the number of correct response in lower group

N=the number of students in either group

c. Determining the discriminating power

The discriminating power (DP) of an item analysis is its power to discriminate the upper and lower groups. The difference between the correct responses in the two groups will be an indication of how far it can discriminate between the two groups. The value of DP> 0.5 indicates that the item can discriminate between the members of a group. So all those items having DP> 0.5 is selected for the final test.

DP=U-L/N

U=the number of correct response in upper group

L= the number of correct response in lower group

N=the number of students in either group

Table 1
Item Analysis

Sl. No.	U	L	DP	DI	Selected/ omitted
1	28	14	0.467	0.7	**S**
2	26	17	0.3	0.717	**S**
3	24	3	0.7	0.45	**S**
4	16	7	0.388	0.583	**S**
5	7	8	-0.033	0.25	**O**
6	27	18	0.385	0.75	**S**
7	24	19	0.167	0.717	**O**
8	27	22	0.167	0.817	**O**
9	15	6	0.54	0.65	**S**
10	27	17	0.53	0.73	**S**
11	18	1	0.56	0.81	**S**
12	17	3	0.46	0.73	**S**
13	16	11	0.167	0.45	**O**
14	21	10	0.367	0.517	**S**
15	24	8	0.533	0.533	**S**
16	19	12	0.233	0.217	**O**
17	27	17	0.33	0.73	**S**
18	17	6	0.467	0.583	**S**
19	15	1	0.467	0.767	**S**
20	25	9	0.533	0.567	**S**
21	26	19	0.233	0.75	**O**
22	25	12	0.433	0.617	**S**
23	30	19	0.367	0.817	**S**

24	6	6	0	0.2	O
25	30	18	0.4	0.8	S
26	27	14	0.433	0.68	S
27	7	9	-0.067	0.267	O
28	24	15	0.3	0.65	S
29	29	13	0.533	0.7	S
30	4	1	0.1	0.083	O
31	28	22	0.2	0.633	O
32	23	13	0.33	0.6	S
33	30	21	0.3	0.85	S
34	1	3	-0.067	0.067	O
35	2	2	0	0.067	O
36	3	2	0.033	0.083	O
37	1	2	-0.033	0.05	O
38	18	6	0.4	0.644	S
39	26	14	0.4	0.667	S
40	23	14	0.3	0.617	S
41	23	14	0.3	0.617	S
42	13	3	0.433	0.867	S
43	14	13	0.033	0.45	O
44	16	0	0.53	0.626	S
45	21	4	0.567	0.417	S
46	18	3	0.5	0.635	S
47	7	7	0	0.233	O
48	21	12	0.38	0.55	S
49	25	8	0.567	0.55	S
50	24	6	0.6	0.52	S
51	30	17	0.43	0.78	S
52	26	16	0.33	0.7	S
53	4	2	0.067	0.1	O
54	28	24	0.133	0.667	O
55	16	5	0.4	0.667	S
56	20	10	0.33	0.5	S
57	29	13	0.53	0.7	S
58	27	18	0.3	0.75	S
59	17	4	0.433	0.35	S
60	22	7	0.5	0.483	S

Validity of the test

The most important quality of the test is its ability to measure what it intend to measure, the attainment of objectives for which it is designed. Validity of a test is the accuracy with which the test is able to measure the ability or trait that the test is supposed to test. There is no such thing as a test having no validity at all or having complete validity. A test may be valid for a particular purpose but may not be valid for another. Therefore the question of validity is a relative factor. To what extend a test is valid a point of reference is to be verified and thus the validity of a test is established. By item analysis each item was validated. Hence what remained was to determine statistical validity of the test by correlating with another standardized test in the same subject of proven validity.

Reliability of a test

Throughout the history of psychometrics, various concepts and methods have been formulated to represent and estimate the degree of inter-connectedness between the corresponding item scores. While the various methods of reliability estimation are associated with conspicuous differences, all forms of test score reliability may be argued to be based on the notion of repeated measurements (Brennan, 2001). The most well known are "parallel forms reliability" and "test–retest reliability". Within the context of reliability estimation via a single-testing session the most well-known reliability methods are "split-half reliability" and "Cronbach's alpha" (a). Less well-known methods of estimating internal consistency reliability are

based directly upon latent variable model solutions. The well-established method of estimating the internal consistency reliability of a composite score via a latent variable model solution is known as "McDonald's omega" (O).

The reliability of the test used in the study was calculated using Split-Half method. The correlation between the scores was calculated using Pearson's product moment coefficient of correlation. The reliability of the test was calculated using Gutman's split half method and the score obtained for the Pedagogical content knowledge test was found to be 0.68. Cronbach Alpha method was used to find out the reliability and the value obtained was 0.72.

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