DOCUMENT RESUME

ED 442 851 TM 031 271

AUTHOR van Berkel, Henk J. M.; van Til, Cita T.
TITLE Group Performing in a Problem-Based Curriculum: The Development and Evaluation of an Instrument.
PUB DATE 1998-04-17
NOTE 8p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Diego, CA, April 15-17, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cooperative Learning; *Curriculum; Evaluation Methods; Foreign Countries; Higher Education; Participation; *Problem Based Learning; Psychometrics; *Reliability; *Validity

ABSTRACT

In a problem-based curriculum, emphasis is placed on the groups in which students learn to analyze problems and to contribute to the solution of a problem. This paper describes an instrument that aims to measure individual group performing and presents some psychometric results. Reliability and validity were studied with 240 students in groups of 9 with 1 tutor. The instrument appears to be reliable, with coefficient alpha varying from 0.84 to 0.92, and it seems that it is a valid measure for characteristics that are important in a problem-based curriculum: (1) participating in discussions; (2) explaining things to other students; and (3) a broad study approach. (Contains 2 tables and 11 references.) (SLD)

GROUP PERFORMING IN A PROBLEM-BASED CURRICULUM: The development and evaluation of an instrument.[1]

Henk J.M. van Berkel & Cita T. van Til
Maastricht University
P.O. Box 616
6200 MD Maastricht
The Netherlands
March 22th 1998

ABSTRACT

In a problem-based curriculum emphasis is given to groups. In a group students learn to analyze problems and to contribute to the solution of the problem. Students also learn to cooperate. The paper describes an instrument which aims to measure individual group performing. Also some psychometric results are presented. The instrument turns out to be reliable (coefficient alpha varies from 0.84 to 0.92) and it seems that the instrument is a valid measure for characteristics which are important in a problem -based curriculum: participating in discussion, explaining to other students, and a broad study -approach.

INTRODUCTION

Education is generally seen as a process of transmission of (Barrows, 1983; Bruhn, 1992; Schmidt, 1993; Van der Vleuten & Wijnen, 1990). There are teachers who have knowledge at their disposal. They passes this onto a student. The student receives knowledge from the master. One could also approach education from the other direction, beginning with the student who wishes to acquire knowledge and who comes to an education institution, which provides the opportunities and tools for this purpose. These could be books or articles, audio - visual aids, or practical attachments, fellow -students or teachers. The teacher is, in this case, no longer the person, who provides students with ready -made materials in the form of lectures and notes. Instead the teachers become the student's guides, who stimulate the learning process and, where necessary, indicate the direction that it can take. As a result, education is no longer, as is generally the case, teacher- centered, but student-centered (Van Berkel, 1990; Norman & Schmidt, 1992).

The process of problem- based learning starts with an analysis of the problem that is offered by (one of) the assignment(s) in the block boo k. Students discuss in a group session the nature of the problem and think of as much knowledge that is possibly related to the subject. Students utter freely the considerations and ideas/inventions that come into mind as free associations during the brainstorming phase. After that a critical evaluation takes place of the proposed knowledge items and points of consideration, the group tries to weigh the propositions on their relevance and importance both in relation to the specific problem considered and to the knowledge domain where the problem was taken from, and position the not discarded topics into a structured frame of reference. At the end of this first group

[1] Paper presented at the AERA-conference (San Diego) on April 17th 1998

session the group determines which aspects they want to investigate more deeply. These aspects are recorded in 'learning objectives', stated in the form of questions that guide the self study activities that take place between the first and second group session. All group members occupy themselves individually or in cooperation with other students with the connected study topics with the help of handbooks, literature, etc. At the following group meeting an inventory is made of the results of this study. This will often lead to group discussion. Two members of the group can, for example, arrive at d ifferent answers to the same question, or it can be that the material that has been studied, does not provide sufficient clarity. Being critically active with the information one has found, increases the depth of insight into the problem (Schor et al., 1997; Norman & Schmidt, 1992; Schmidt & Moust, 1995). If the group determines that they have made sufficient progress with a problem, they start with the next assignment in the block book.

Besides content-oriented learning goals, social skills and attitudes are also essential in preparing for a profession, e.g.: active listening to students, acquiring professional attitude in problem settings, verbal participating in a discussion, playing the role of chairman, and reporting in the group about individual study activities (Van Berkel, 1990). This kind of learning objective is not evaluated in the end- of-course test. The faculty of Health Sciences at the Maastricht University developed an instrument for qualifying students' performing in tutorial groups. The objective of this study is to evaluate the instrument.

INSTRUMENT

At the end of a course the tutor judges the adequacy of students group performing/participation with regard to the following criteria for effective performing in problem-based group learning.

1 Contribution to the analysis of the problem and to the statement of the learning- goals;
2 Keeping one's agreement;
3 Contribution to the discussion concerning the collected data;
4 Fulfilling the role of chairman in a group session;
5 Contribution to the promotion of the group process.

The judgement of the tutor is a dichotomous one: a student receives or receives not a so -called 'PTG-point' (*P*erforming in *T*utorial Groups -points). There is a limit to the number of PTG-points a tutor may distribute: the maximum number of points may not exceed the number of group members divided by two. The faculty decided for the limit because a pilot experience of the method demonstrated that tutors are too generous: they donated almost every student in the group with a point, because tutors found it hard to disqualify students. This is not an unusual finding. In face-to-face judgements there is a consistent lack of discrimination. So it was compulsory for tutors to use normative based judgements, although it is presume d that in this situation criterion-based judgements are favorable: if each student performs well according to the criteria, each student deserves a PTG -point. On the other hand, it turns out that the mean percentage of distributed PTG -points was 31%, in st ead of 50%. So in practice the tutors judged criterion-based.

Because there are six courses a year, the maximum number of points a student can receive in a year, is six. To a certain degree, the collected points can compensate the score on the end-of-unit test (see Van Berkel, 1995).

PROCEDURE

To determine the psychometric qualities of the instrument an evaluation study was initiated. In a parallel judgment procedure all the group participants, tutor and students, were asked to choose the three fellow students who to their opinion were the best candidates to receive a PTG-point, and state their names in order of preference. Next these three students had to be rated on a list of characteristics that constitutes an operationalization of the five judgment criteria in terms of group performing behavior (scheme 1). These operationalizations were taken from several studies regarding problem-based learning (Schmidt, 1993; Norman & Schmidt, 1992; Cariaga-lo et al., 1996).

(Insert scheme 1 here)

ANALYSIS

The psychometric analysis applied to these data consisted of two parts. First, the inter-rater reliability of the parallel PTG-judgment was calculated by computing coefficient alpha. Second, the validity of the judgment procedure was determined by its predictability from behavior characteristics.

Reliability
The population comprised 240 students. Because this population is randomly assigned to tutorial groups, all the judgment panels (i.e., each nine fellow students and a tutor), can legitimately be regarded as replications, just as is the case with parallel tests. So, it is justified to calculate alpha reliability on a 'test' matrix, containing ten items for each judged student in the population (Thorndike, 1982). Alpha coefficient was 0.88, a remarkable high value. This result means that there is a strong agreement among students on which students can be rewarded with a PTG-point. We also computed the correlation between the rating of the tutor and the ratings in the parallel judgment procedure used in t he evaluation study. The correlation was 0.87, indicating that the judgment procedure in this study is highly representative to the qualifications that students assign in the formal context.

Validity
Predictability of group performing judgment was determi ned against two criterion variables.

1. receiving a PTG-point by the tutor, (scored: yes/no)
2. the number of received PTG -points by the students.

The prediction of these two criteria was investigated by means of discriminant -analysis (criterion 1) and regression analysis (criterion 2).
The discriminant function, determined by entering all twenty behavior characteristics of the questionnaire, delivered a correct classification for 81% of the students on the criterion: yes or no a PTG-point. (When the PTG-points are randomly assigned the percentage correct classification is of course 50).

(Insert table 1 here)

The items which show the highest correlation (=> 0.30) with the discriminant function are the items 01 (r = 0.62), 20 (-0.51), 16 (0.47), 03 (0.41), and 14 (0.31).

The regression analysis (Method: Enter) indicated that the twenty items explain 56% of the variance in criterion 2 (see table 2).

(Insert table 2 here)

The items that showed to be the most important in the discriminant analysis related to criterion 1, were also the ones that contributed significantly to the regression results for criterion 2: item 01 (Beta = 0.39), 16 (0.27), 14 (0.22), 03 (0.17%), except item 20, that received a beta value of only 0.05.

CONCLUSION AND DISCUSSION

Only five of the twenty behavior characteristics contribute significantly to a prediction of PTG-ratings (regression analysis), although most of the items ideally are to be regarded as highly relevant indicators of the five judgment criteria. Clearly the most important factor that determines a students chance on receiving a PTG-qualification, is his/her verbal dominancy in the group (items 01, 20), but some important qualitative aspects of group performing likewise contribute substantially (items 03, 14, 16). The activities referred to in these items, mainly concern the presentation of acquired knowledge (items 03, 16).
Interrater-reliability appears to be high. Apparently it is evident to most group members which of them should be assigned the PTG-point. This is not a surprising result, looking at the best predictor of the PTG-score, the amount of students' talking in the group, because talking as such is a clearly observable characteristic. But it appears that also other, less clear- cut aspects play a role of significance in the valuation of a student by other participants as 'contributing to group effectiveness'. With respect to these characteristics (like 'uses a broad perspective') reasonably much more divergence in position could be expected between judges, resulting in less homogeneity of their qualifications.

REFERENCES

Barrows, H.S. (1983). Problem-based, self directed learning. *Journal of the American Medical Association, 250 (22),* 3077-3080.

Bruhn, J:G. (1992). Problem-based learning: an approach toward reforming allied health education. *Journal of Allied Health, 21,* 161-173.

CariagaLo, L.D., Richards, B.F., Hollingsworth, M.A. & Camp, D.L. (1996). Non-cognitive characteristics of medical students: Entry to problem-based and lecture-based curricula. *Medical Education, 30,* 179-186.

Norman, G.R. & Schmidt, H.G. (1992). The psychological basis of problem-based learning. *Medical Education, 22,* 279-286.

Schmidt, H.G. (1993). Foundations of problem-based learning: some explanatory notes. *Medical Education, 27,* 422-432.

Schor, F.N., Troen, P., Kanter, S.L. & Janosky, J.E. (1997). Interrater concordance for faculty grading of student performances in a problem- based learning course. *Academic Medicine, 72,* 150-151.

Schmidt, H.G. & Moust, J.H. (1995). What makes a tutor effective? A structural-equations modeling approach to learning in problem-based curricula. *Academic medicine, 70,* 708 - 714.

Thorndike, R.L. (1982). Item and score conversion by pooled judgement. In: P.W. Holland & D.B. Rubin (Eds.) *Test Equating.* New York: Academic Press.

Van Berkel, H.J.M. (1990). Assessment in a problem-based medical curriculum. *Higher Education, 19,* 123-146.

Van Berkel, H.J.M., Nuy, H.J.P. & Geerligs, T. (1995). The influence of progress tests and block tests on study behavior. *Instructional Science, 22,* 315-331.

Van der Vleuten, C.P.M. & Wijnen, W.H.F.W. (Eds.) (1990). *Perspec tives from the Maastricht Experience.* Amsterdam: Thesis-publ.

Scheme 1: Characteristics of group performing behavior

Item	*Characteristic*
01	Talks little/much
02	Produces useful ideas
03	Explains to other students in the group
04	Asks for explanations
05	Poses questions to the tutor
06	Reacts to questions/suggestions of the tutor
07	Makes corrections on other group members' contributions
08	Does not just accept information as being true
09	Watches over the discussion in general
10	Is prepared to fulfill the role of chair
11	Takes position with regard to the process of group cooperation
12	States opinions about the advisable task approach
13	Works hard during self study time
14	Uses a broad perspective in his/her study approach
15	Always completes his/her home work
16	Supplies an useful contribution to reporting activities
17	Gives the impression to be interested
18	His/her choice of activities is ruled by weighing considerations of usefulness
19	Poses high demands on learning results
20	Seems to be inhibited to say a lot

Table 1: Correlations between characteristics of group performing behavior and the discrimination function

Item	*Characteristic*	*Correlation*
01	Talks little/much	0.62
02	Produces useful ideas	0.23
03	Explains to other students in the group	0.41
04	Asks for explanations	0.10
05	Poses questions to the tutor	0.08
06	Reacts to questions/suggestions of the tutor	0.23
07	Makes corrections on other group members' contributions	0.01
08	Does not just accept information as being true	0.10
09	Watches over the discussion in general	0.14
10	Is prepared to fulfill the role of chair	0.15
11	Takes position with regard to the process of group cooperation	0.28
12	States opinions about the advisable task approach	0.17
13	Works hard during self study time	0.29
14	Uses a broad perspective in his/her study approach	0.31
15	Always completes his/her home work	0.21
16	Supplies an useful contribution to reporting activities	0.47
17	Gives the impression to be interested	0.18
18	His/her choice of activities is ruled by weighing considerations of usefulness	0.08
19	Poses high demands on learning results	0.16
20	Seems to be inhibited to say a lot	-0.51

Table 2: Multiple regression analysis (method Enter): Getting a PTG-point (independent variable) and characteristics of group performing behavior (dependent variables)

Item	*Characteristic*	*Beta*	*Significance*
01	Talks little/much	0.39	0.00
02	Produces useful ideas	-0.17	0.04
03	Explains to other students in the group	0.17	0.04
04	Asks for explanations	-0.09	
05	Poses questions to the tutor	0.06	
06	Reacts to questions/suggestions of the tutor	0.01	
07	Makes corrections on other group members' contributions	-0.15	0.09
08	Does not just accept information as being true	-0.07	
09	Watches over the discussion in general	0.13	0.07
10	Is prepared to fulfill the role of chair	-0.01	
11	Takes position with regard to the process of group cooperation	-0.11	
12	States opinions about the advisable task approach	0.01	
13	Works hard during self study time	-0.04	
14	Uses a broad perspective in his/her study approach	0.22	0.00
15	Always completes his/her home work	0.04	
16	Supplies an useful contribution to reporting activities	0.27	0.01
17	Gives the impression to be interested	0.00	
18	His/her choice of activities is ruled by weighing considerations of usefulness	-0.04	
19	Poses high demands on learning results	0.14	0.09
20	Seems to be inhibited to say a lot	-0.05	

Multiple R: 0.74
R-square 0.56
Sign. F: 0.00

TM031271

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

Reproduction Release
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Group performing in a problem-based curriculum: The development and evaluation of an instrument	
Author(s): Henk J.M. van Berkel & Cita. T. van Til	
Corporate Source:	Publication Date: April 1998

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, Resources in Education (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign in the indicated space following.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker sh all Level 2B documen
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY SAMPLE TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY SAMPLE TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)	PERMISSION TO DISSEMINATE T MICROFICHE ONLY E SA TO THE EDUCAT INFORMATIO
Level 1	**Level 2A**	**Level 2B**
XX	☐	☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g. electronic) *and*	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level reproduction and diss

paper copy.		

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate indicated above. Reproduction from the ERIC microfiche, or electronic media by persons other than ERIC employees and its sy requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service a information needs of educators in response to discrete inquiries.

Signature:	Printed Name/Position/Title: Henk J.M. van Berkel, PhD.	
Organization/Address: Maastricht University P.O. Box 616 6200 MD Maastricht The Netherlands	Telephone: .. 43 388 1121 E-mail Address: h.vanberkel@educ.unimaas.nl	Fax: ... 43 388 4140 Date: November 9th 1999

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:
Address:
Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:
Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:	
ERIC Clearinghouse on Assessment and Evaluation **1129 Shriver Laboratory (Bldg 075)** **College Park, Maryland 20742**	**Telephone: 301-405-7449** **Toll Free: 800-464-3742** **Fax: 301-405-8134** **ericae@ericae.net** **http://ericae.net**

EFF-088 (Rev. 9/97)