

Development and validation of an instrument to measure the postgraduate clinical learning and teaching educational environment for hospital-based junior doctors in the UK

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SUMMARY *This paper describes the development and validation of a 40-item inventory, the Postgraduate Hospital Educational Environment Measure (PHEEM), by researchers in Scotland and the West Midlands using a combination of grounded theory and Delphi process. The instrument has since returned an alpha reliability >0.91 in two administrations in England and may be a useful instrument in the quality assurance process for postgraduate medical education and training.*

Background

Genn (2001) and Harden (2001) have pointed to the potential of the understanding of learning environments and sub-environments for managing curriculum development and change. Stimulated by their suggestions for action research in their earlier paper (Genn & Harden, 1986), Roff *et al.* (1997) developed the 50-item Dundee Ready Education Environment Measure with a panel of nearly 100 medical educators and 1000 students to measure and 'diagnose' undergraduate educational climates in the health professions. This instrument has been translated into Spanish, Portuguese, Arabic, Swedish, Malay and Thai and used in several settings including the Middle East, Thailand (Primpayon *et al.*, 2000), Nepal and Nigeria (Roff *et al.*, 2001) and the West Indies (Bassaw *et al.*, 2003). It is currently being used in the UK, Canada, Ireland, Thailand, China, Indonesia, Malaysia, Norway, Sweden, Brazil, the West Indies and the Yemen.

A similar methodology has been utilized to develop and validate an inventory to measure the postgraduate clinical teaching and learning environment for hospital-based junior doctors. A 40-item inventory was developed.

Methods

A form of grounded theory was used involving focus groups, nominal groups and a Delphi panel drawn from the target populations in two phases.

Phase 1

In the first stage of the process, a group of 12 Scottish Postgraduate Deans, Postgraduate Educational Supervisors, Educational Advisors and PRHOs met in January 2000 to agree an initial list of possible items for inclusion in the

inventory based on a literature review (conducted by McAleer and Roff) of articles retrieved from MEDLINE and mission statements such as the GMC's *The New Doctor*, together with their own observations of significant events/critical incidents in PRHO training. The literature review had generated 180 items which the stakeholders reduced to 150 items by eliminating repetitive material and consolidating some items. These were critiqued by colleagues in the Educational Development Unit of the Scottish Council for Postgraduate Medical and Dental Education and the Centre for Medical Education at the University of Dundee and on the basis of their feedback concerning repetition and clarity the inventory was further reduced to 132 items.

In order to validate and prioritize the 132 items into a more manageable inventory, a random sample of 10% of the current PRHOs in post in Scotland was sought. Since direct access to PRHOs in post is difficult due to the transience of their posts, they were contacted via their Educational Supervisors. Two copies of the 132-item preliminary inventory were mailed to the 175 Educational Supervisors who were each asked to distribute them to one or two PRHOs who would then return them directly to the researchers in a return paid envelope which was coded for the 'educational centre' (hospital where the PRHO was in post) but were otherwise anonymous. Respondents were asked to rate the items on a Likert-type scale of 0 (not at all important) to 4 (highly important) according to how important they felt each item was in creating a good learning environment for PRHOs. One hundred and seventeen responses were returned which is 17% of the estimated 680 PRHOs in post at the time. Eight of these responses were returned late, after the analysis had been undertaken. Responses were received from 88 'educational centres' including the four major areas of Glasgow, Edinburgh, Dundee and Aberdeen as well as smaller centres such as Oban, Ayr, Inverness and Kirkcaldy. This meant that 50% of the Educational Supervisors had successfully distributed the questionnaire to at least one trainee. Several Educational Supervisors indicated that they did not have PRHOs in this rotation and returned the questionnaires.

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Table 1. The PHEEM—items grouped by sub-scale (negative items in italics).

I. Perceptions of role autonomy:

- 1 I have a contract of employment that provides information about hours of work
- 4 I had an informative induction programme
- 5 I have the appropriate level of responsibility in this post
- 8 *I have to perform inappropriate tasks*
- 9 There is an informative Junior Doctors Handbook
- 11 *I am bleeped inappropriately*
- 14 There are clear clinical protocols in this post
- 17 My hours conform to the New Deal
- 18 I have the opportunity to provide continuity of care
- 29 I feel part of a team working here
- 30 I have opportunities to acquire the appropriate practical procedures for my grade
- 32 My workload in this job is fine
- 34 The training in this post makes me feel ready to be an SpR/Consultant
- 40 My clinical teachers promote an atmosphere of mutual respect

14 items/max score 56 for this sub-scale

II. Perceptions of teaching:

- 2 My clinical teachers set clear expectations
- 3 I have protected educational time in this post
- 6 I have good clinical supervision at all times
- 10 My clinical teachers have good communication skills
- 12 I am able to participate actively in educational events
- 15 My clinical teachers are enthusiastic
- 21 There is access to an educational programme relevant to my needs
- 22 I get regular feedback from seniors
- 23 My clinical teachers are well organized
- 27 I have enough clinical learning opportunities for my needs
- 28 My clinical teachers have good teaching skills
- 31 My clinical teachers are accessible
- 33 Senior staff utilize learning opportunities effectively
- 37 My clinical teachers encourage me to be an independent learner
- 39 The clinical teachers provide me with good feedback on my strengths and weaknesses

15 items/max score 60 for this sub-scale

III. Perceptions of social support:

- 7 *There is racism in this post*
- 13 *There is sex discrimination in this post*
- 16 I have good collaboration with other doctors in my grade
- 19 I have suitable access to careers advice
- 20 This hospital has good quality accommodation for junior doctors, especially when on call
- 24 I feel physically safe within the hospital environment
- 25 There is a no-blame culture in this post
- 26 There are adequate catering facilities when I am on call
- 35 My clinical teachers have good mentoring skills
- 36 I get a lot of enjoyment out of my present job
- 38 There are good counselling opportunities for junior doctors who fail to complete their training satisfactorily

11 items/max score 44 for this sub-scale

Interpreting the sub-scales:

I. Perceptions of role autonomy:

- 0–14 very poor
- 15–28 a negative view of one's role
- 29–42 a more positive perception of one's job
- 43–56 excellent perception of one's job

II. Perceptions of teaching:

- 0–15 very poor quality
- 16–30 in need of some retraining
- 31–45 moving in the right direction
- 46–60 model teachers

(continued)

Table 1. Continued.

III. Perceptions of social support:	
0–11	non-existent
12–22	not a pleasant place
23–33	more pros than cons
34–44	a good supportive environment

Note: The PHEEM can also be used to pinpoint more specific strengths and weaknesses within the educational climate. To do this one needs to look at the responses to individual items. Items that have a mean score of 3.5 or over are real positive points. Any item with a mean of 2 or less should be examined more closely as they indicate problem areas. Items with a mean between 2 and 3 are aspects of the climate that could be enhanced.

One hundred and nine responses were fully completed and returned in a timely manner. Fifty-eight (53%) were from males and 51 (47%) were from females. Respondents were asked to rate the 132 items in terms of how they perceived the importance for the learning environment of PRHOs. On a score of 0–4, 17 items were rated ≥ 3.5 ; 69 were rated ≥ 3.00 but ≤ 3.49 and the remaining 46 were rated ≤ 3.00 . Several of the highest ranked items came from the end of the 132-item list, suggesting that the length of the questionnaire was not a problem. Eight items received statistically significant ratings from the males and females, but these differences did not affect their broad categorization ≥ 3.00 / ≤ 3.00 in the total rank order list. The reliability was high with an alpha of 0.93.

The top ranking 90 items were retained for the second version of the inventory.

Phase 2

A focus group ($n=10$) consisting of a consultant paediatrician/assessor for the Royal College of Paediatrics and Child Health, five Senior House Officers and four Specialist Registrars in the Department of Paediatrics at a Birmingham hospital was convened to review the 90 item inventory. They were asked to rate the most relevant items in their perception of a good clinical teaching and learning environment for hospital-based junior doctors. Items which three or more members of the focus group considered least relevant were eliminated from the inventory. This exercise in checking face validity among the stakeholders reduced the inventory to 40 items, four of which (nos. 7, 8, 11, 13) are negative statements which have to be reversed for scoring.

A nominal group of three of the researchers then identified three sub-scales—Perceptions of role autonomy, Perceptions of teaching and Perceptions of social support.

Results

The final instrument produced, the 'Postgraduate Hospital Educational Environment Measure' (PHEEM), is included as Appendix 2. The items grouped by sub-scale are given in Table 1. These were grouped into three sections, as indicated below, together with the maximum score for each sub-scale:

- Perceptions of role autonomy: $14 \times 4 = 56$ max;
- Perceptions of teaching: $15 \times 4 = 60$ max; and

- Perceptions of social support: $11 \times 4 = 44$ max.

This is made up of the number of items in the sub-scale times the maximum mark on a Likert scale of 0–4. The possible maximum score is 160 and the minimum score is 0.

Information about administering PHEEM and scoring and interpreting the students' responses is given in Appendix 1.

Discussion

The two-phase process of grounded theory research involving stakeholders from the relevant junior doctor grades together with educational advisors and senior managers in Scotland and Birmingham generated a 40-item inventory with three sub-scales with apparent high face validity both for the UK and in relation to other studies (Rotem *et al.*, 1995; Mitchell *et al.*, 1999; Pololi & Price, 2000; Fernald *et al.*, 2001; Dolmans *et al.*, 2004). Skinner has since administered this 40-item inventory to 68 Senior House Officers and 32 Specialist Registrars in Birmingham teaching hospitals from a range of specialties and these results are reported separately. The Postgraduate Hospital Education Environment Measure (PHEEM) had an alpha reliability of 0.91 in that administration. Clapham *et al.* (2005) administered the PHEEM to 134 trainees at nine Intensive Care Units in England and Scotland. The Cronbach's alpha for this administration was 0.92 and no rogue questions were detected by the 'alpha if item deleted' function in SPSS.

It is hoped that other researchers and managers of junior doctor teaching and learning in the UK, and perhaps beyond, will find it a useful quality assessment tool for both single-use and longitudinal studies of hospital-based clinical teaching and learning for junior doctors. Newbury-Birch & Kamali (2001), for instance, have concluded that the level of supervision provided by superiors, flexibility and freedom in the job and level of participation in important decision-making are correlated with levels of stress and anxiety in pre-registration house officers in the UK.

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Appendix 1: Scoring the Postgraduate Hospital Educational Environment Measure (PHEEM)

The PHEEM contains 40 statements covering a range of topics directly relevant to the educational climate of Senior House Officers (SHOs) and Specialist Registrars (SpRs) (Appendix 1). The inventory can be administered by postal or electronic survey or face-to-face. Respondents are asked to read each statement carefully and to respond using a 5-point Likert scale ranging from 'strongly agree' to 'strongly disagree'. It is important that each doctor applies the items to their own current learning situation and respond to all 40.

Items should be scored: 4 for Strongly Agree (SA), 3 for Agree (A), 2 for Uncertain (U), 1 for Disagree (D) and 0 for Strongly Disagree (SD). However, four of the 40 items (Numbers 7, 8, 11 and 13) are negative statements and should be scored: 0 for SA, 1 for A, 2 for U, 3 for D and 4 for SD.

The 40-item PHEEM has a maximum score of 160 indicating the ideal educational environment as perceived by the SHO/SpR. A score of 0 is the minimum and would be a very worrying result for any medical educator.

The following is an approximate guide to interpreting the overall score:

0–40	very poor,
41–80	plenty of problems, more positive than negative
81–120	but room for improvement, and
121–160	excellent.

Interpret a score of 80 as an environment which is viewed with considerable ambivalence by the SHOs/SpRs and as such needs to be carefully reviewed.

As well as the total PHEEM score there are three sub-scales: Perception of role autonomy; Perceptions of teaching; and Perceptions of social support. Table 1 shows the items within each sub-scale (negative items are italicized).

Appendix 2: Postgraduate Hospital Educational Environment Measure

Postgraduate Hospital Educational Environment Measure

Sex: Male Female

Training Grade: PRHO SHO SpR

Year in present grade: 1 2 3 4 5

Speciality: Surgical Medical Paediatric
 Obs & Gynae Other

The following items all relate to your current SHO or SpR experience. Please read each statement and rate it as it applies to your own feelings about your present position in this hospital. It is about your personal perceptions of the current post.

Please tick the appropriate box.		<i>Strongly Agree</i>	<i>Agree</i>	<i>Uncertain</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1	I have a contract of employment that provides information about hours of work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	My clinical teachers set clear expectations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	I have protected educational time in this post	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	I had an informative induction programme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	I have the appropriate level of responsibility in this post	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	I have good clinical supervision at all times	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	There is racism in this post	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	I have to perform inappropriate tasks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	There is an informative Junior Doctors handbook	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	My clinical teachers have good communication skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	I am bleeped inappropriately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	I am able to participate actively in educational events	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	There is sex discrimination in this post	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	There are clear clinical protocols in this post	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	My clinical teachers are enthusiastic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	I have good collaboration with other doctors in my grade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	My hours conform to the New Deal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	I have the opportunity to provide continuity of care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	I have suitability access to careers advice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
20	This hospital has good quality accommodation for junior doctors, especially when on call	<input type="checkbox"/>				
21	There is access to an educational programme relevant to my needs	<input type="checkbox"/>				
22	I get regular feedback from seniors	<input type="checkbox"/>				
23	My clinical teachers are well organised	<input type="checkbox"/>				
24	I feel physically safe within the hospital environment	<input type="checkbox"/>				
25	There is a no-blame culture in this post	<input type="checkbox"/>				
26	There are adequate catering facilities when I am on call	<input type="checkbox"/>				
27	I have enough clinical learning opportunities for my needs	<input type="checkbox"/>				
28	My clinical teachers have good teaching skills	<input type="checkbox"/>				
29	I feel part of a team working here	<input type="checkbox"/>				
30	I have opportunities to acquire the appropriate practical procedures for my grade	<input type="checkbox"/>				
31	My clinical teachers are accessible	<input type="checkbox"/>				
32	My workload in this job is fine	<input type="checkbox"/>				
33	Senior staff utilise learning opportunities effectively	<input type="checkbox"/>				
34	The training in this post makes me feel ready to be a SpR/Consultant	<input type="checkbox"/>				
35	My clinical teachers have good mentoring skills	<input type="checkbox"/>				
36	I get a lot of enjoyment out of my present job	<input type="checkbox"/>				
37	My clinical teachers encourage me to be an independent learner	<input type="checkbox"/>				
38	There are good counselling opportunities for junior doctors who fail to complete their training satisfactorily	<input type="checkbox"/>				
39	The clinical teachers provide me with good feedback on my strengths and weaknesses	<input type="checkbox"/>				
40	My clinical teachers promote an atmosphere of mutual respect	<input type="checkbox"/>				

Comments _____
