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Citation for author's accepted version

Dunn, Sandra and Burnett, Paul (post-print). The development of a clinical learning environment scale. Retrieved from <http://espace.cdu.edu.au/view/cdu:46226>

Citation for publisher's version

Dunn, Sandra and Burnett, Paul (1995). The development of a clinical learning environment scale. *Journal of Advanced Nursing*,22(6):1166-1173.

Notice: *The publisher's version of this work can be found at:*

<http://dx.doi.org/10.1111/j.1365-2648.1995.tb03119.x>

The development of a clinical learning environment scale

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Abstract

Within nursing, there is a strong demand for high-quality, cost-effective clinical education experiences that facilitate student learning in the clinical setting. The clinical learning environment (CLE) is the interactive network of forces within the clinical setting that influence the students' clinical learning outcomes. The identification of factors that characterize CLE could lead to strategies that foster the factors most predictive of desirable student learning outcomes and ameliorate those which may have a negative impact on student outcomes. The CLE scale is a 23-item instrument with five subscales: staff-student relationships, nurse manager commitment, patient relationships, interpersonal relationships, and student satisfaction. These factors have strong substantive face validity and construct validity, as determined by confirmatory factor analysis. Reliability coefficients range from high (0.85) to marginal (0.63). The CLE scale provides the educator with a valid and reliable instrument to evaluate affectively relevant factors in the CLE, direct resources to areas where improvement may be required, and nurture those areas functioning well. It will assist in the application of resources in a cost-effective, efficient, productive manner, and will ensure that the clinical learning experience offers the nursing student the best possible learning outcomes.

Introduction

Nursing students must be prepared to integrate a strong theoretical base with clinical competence in order to provide safe, beginning-level nursing care (Australasian Nurse Registration Authority Committee, 1990, Benner, 1984, Tanner, 1987). The drive to prepare nurses capable of 'doing' as well as 'knowing' has meant that clinical education has remained a significant component of the undergraduate nursing curricula. Although the human and economic resources to fulfil these demands are enormous, research which guides problem solving, resource allocation, and effective learning in the area of clinical education is limited (Infante, 1981, Tanner, 1987). Of the 15 highest priorities for nursing research identified by Tanner & Lindeman (1987), 10 focused on clinical education. The authors stated research in nursing education does focus in the educational process but must emphasize the clinical nature of nursing.

Within nursing, the evaluation of clinical teaching and learning has been of interest for many years. Infante (1981) stated that 'clinical learning activities, the heart of nursing's professional program of study, have been the most widely discussed yet the least studied of all nursing education activities.' Of particular concern is the perceived demand for high-quality, cost-effective clinical education experiences that facilitate student learning in the clinical setting. The identification of those factors that characterize a clinical learning environment (CLE) could lead to strategies that foster the factors most predictive of desirable student learning outcomes and ameliorate those which may have a negative impact on student outcomes.

Concept of Learning Environment

The concept of learning environment has been well accepted in the educational literature (Biggs, 1987, Bloom, 1964, Keeves, 1972) but is a relatively new to nursing education (Fretwell, 1980, Hart, 1992, Orton, 1981). Bloom (1964) has described the educational environment as:

"the conditions, forces, and external stimuli which impinge on the individual. These forces may be physical, social, as well as intellectual forces and conditions. We conceive of a range of environments from the most immediate social interactions to the more remote cultural and institutional forces. We regard the environment as providing a network of forces and factors which surround, engulf, and play on the individual."

The CLE is an interactive network of forces within the clinical setting that influence the students' clinical learning outcomes (Biggs, 1987, Fretwell, 1980, Hart, 1992, Keeves, 1972). Orton (1981) described CLE as a group of stable characteristics unique to a particular clinical setting and impacting on the behaviour of individuals within that setting. Current theory links specific components of CLE to the clinical learning outcomes, but the research in this area is limited.

Much of the early work on CLE occurred in Britain (Fretwell, 1980, Orton, 1981, Pembrey, 1980). Pembrey (1980) published a report on the influence of the 'ward sister', the British equivalent of the nurse manager (NM), in establishing the environment of the clinical ward. Her data were both qualitative and quantitative, including questionnaires, semi-structured interviews and checklists. The wards in the study were all involved in hospital-based nursing education, and the ward sisters were all assigned nursing students as a portion of their working staff. Over 50% of the ward nurses were 'trainees', with the ward sister's responsibility for meeting the education, supervision and assessment requirements of the students varying greatly from institution to institution. Pembrey (1980) concluded that the ward sister was the key to the organization and attitudes of the ward, not only for the learning environment experienced by the students, but for the staff-work environment and the patient-care environment. She suggested that the flexibility to implement individual discretion within prescribed boundaries may be a crucial factor in achieving optimum effective outcomes for the ward staff and students (Pembrey, 1980).

Fretwell (1980) utilised questionnaires, interviews and non-participant observation in a study seeking to identify the characteristics of an 'ideal' learning environment. Fretwell concluded that highly structured wards with rigid task allocation, and wards in which a strict hierarchical system exists, are

unlikely to meet the learning needs of the students. Fretwell supported Pembrey's (1980) findings that the ward sister was a key figure in establishing and maintaining the learning environment. The ward sister's influence extends beyond the formal teaching of students to the provision of student-learning opportunities, and the establishment of a ward atmosphere conducive to learning (Fretwell, 1980).

Learning climate

Orton's (1981) study of 325 student nurses, 27 clinical nursing teachers and 44 ward sisters based in 18 wards in three English metropolitan hospitals explored the existence and key characteristics of a 'ward learning climate'. Orton conducted a series of preliminary interviews with nursing administrators, educators, students and clinicians to validate the results of the literature search and to assist in the development of the survey questions on which the main study would proceed. She then designed a comparative descriptive survey based on the literature review and the results of her interviews. The survey consisted of 124 items scored on a 5-point Likert scale: 'strongly disagree' to 'strongly agree'. These items examined a range of issues beyond the CLE, including students' beliefs about the nursing profession, their opinions on education and the learning process, and their preferences for the organisational arrangements. Orton conducted an exploratory factor analysis to determine scales, or factors, identifying those characteristics most predictive of a ward-learning environment.

Two scales emerged from the factor analysis:

1. The ward sister's recognition of student nurses' needs, comprising:
 - 'All staff on the ward, from the ward sister to the newest student, feel part of a ward team';
 - 'The ward sister attaches great importance to the learning needs of student nurses';
 - 'The ward sister regards the student nurse as a worker rather than as a learner';
 - 'The ward sister is not concerned about what a student nurse is thinking or feeling as long as she is getting on with her/his work'.
2. The ward sister's commitment to teaching, consisting of:
 - 'The ward sister devotes a lot of her time to teaching student nurses';
 - 'The ward sister has a teaching programme for students on this ward';
 - 'Handover is used as an occasion for teaching student nurses'.

Responses to the open-ended survey questions graphically illustrated the characteristics of the good CLE wards. Students did not feel they were caught in the worker-learner dichotomy, and the ward possessed a high degree of staff support and morale. Patient care was given a high profile, and the learning needs of the students were met through well-planned opportunities for teaching and an attitude that placed a high priority on teaching (Orton, 1981).

These British studies clearly recognized the existence of a ward learning environment and identified several areas of importance in the characterization of that environment. Organization and attitude characteristics were major predictors of the CLE. Organisational issues identified included ward routine, patient care, structuring of teaching, and matching of clinical and classroom procedures. A ward attitude that recognized and valued the students as learners was key to describing wards with superior CLE (Orton, 1981). Attitude elements including staff relationships, commitment to teaching and student satisfaction with their clinical experience were identified as characteristics of a good learning environment.

Limitations

A major restriction in generalizing the results of this early work is the context in which the research was conducted. The setting for and nature of nursing education in Britain in the first half of the 1980s was dramatically different from that found in many parts of the world over a decade later. Nursing

education is now usually undertaken outside hospital-based schools of nursing, and the students are frequently supernumerary to the clinical setting. Indeed, even the nursing career structure has evolved and the responsibilities and influence of the nurse manager may not be comparable to that of the 'ward sister' in British studies.

The CLE as it exists for and influences the learning outcomes of the undergraduate nursing student outside the British nursing context is an area ripe for further study and development. The opportunity to develop strategies for enhancing clinical teaching and learning is clear, but will depend on the ability to reliably evaluate the CLE. To this end, the clinical educator requires a reliable and valid instrument for assessing CLE.

Measuring CLE

Instruments to evaluate CLE are relatively new and have not yet been well tested in large sample studies in a variety of settings. There is no well-accepted standard for learning environment measurement against which these instruments can be evaluated. Many of the instruments designed for use with a student nurse population were developed in Britain, and reflect the hospital-based nursing education system in place in Britain (Fretwell, 1980, Orton, 1981, Pembrey, 1980). Hart (1992) developed and tested an instrument in Australia to be used for the evaluation of the ward learning climate for registered nurses, but this instrument was not designed or tested for use with nursing students. The instruments available range from very short and simple (Fretwell, 1980) to considerably more complex, covering a wide range of areas (Hart, 1992).

Organisational and educational theory provides the theoretical basis for understanding and measuring the CLE. Organisational theory explores the interaction of human beings with each other and with their environment in the context of an organization. The nature of the organisational setting, including its structural and hierarchical components, will influence, and be influenced by, the interpersonal relationships of the participants in the organization (Argyris, 1972, Reichers & Schneider, 1990). Educational theory has long recognized the influence contextual factors have on learning (Bloom, 1964, Keeves, 1972). The learning environment includes all the forces or stimuli that impact on the learning and development of the individual, and exists both within and beyond the classroom setting. The educational learning environment may be defined by a limited number of characteristics, including physical surroundings, classroom climate, teaching methods, course structure, curriculum content, and relationships between the participants in the environment (Biggs, 1987, Bloom, 1964, Keeves, 1972).

Factors influencing environment

Factors commonly identified as influencing the environment in Organisational and educational theory are interpersonal relationships, atmosphere/ attitudes, physical structure of the setting, and hierarchical patterns. In addition, the influence of course content and teaching styles are frequently identified in the educational literature (Argyris, 1972, Biggs, 1987, Bloom, 1964, Keeves, 1972, Reichers & Schneider, 1990).

Within the nursing literature, a series of studies over the past one and a half decades has brought the concept of learning environments into the nursing context. Factors perceived as predicative of CLE have included physical facilities and resources (Fretwell, 1980, Reed & Price, 1991), variety and frequency of patient diagnoses and conditions (Fretwell, 1980, Jacka & Lewin, 1986), ward speciality (Fretwell, 1980), patient turnover (Fretwell, 1980, Jacka & Lewin, 1986), patient allocation (Reed & Price, 1991), ward routine (Fretwell, 1980, Reed & Price, 1991), ward workload (Fretwell, 1980), student allocation (Fretwell, 1980, Jacka & Lewin, 1986, Reed & Price, 1991), role clarity (Hart, 1992), structure of supervision of staff (Fretwell, 1980, Hart, 1992), structure of teaching (Biggs, 1987, Fretwell, 1980, Hart, 1992, Keeves, 1972, Reed & Price, 1991), application of research to practice (Reed & Price, 1991) and assessment of learning outcomes (Biggs, 1987, Keeves, 1972, Reed & Price, 1991). In addition, the relationship between classroom and clinical content (Reed & Price, 1991), ward atmosphere (Fretwell, 1980, Reed & Price, 1991), staff relationships (Fretwell, 1980,

Reed & Price, 1991), commitment to teaching (Keeves, 1972, Orton, 1981, Reed & Price, 1991), commitment to learning (Keeves, 1972, Orton, 1981, Reed & Price, 1991), commitment to patient care (Reed & Price, 1991), autonomy and recognition (Hart, 1992), staff job satisfaction (Hart, 1992), staff peer support (Hart, 1992, Reed & Price, 1991), and relationship between clinical and classroom staff (Reed & Price, 1991) have been cited.

The Study

The aim of this study was to develop a reliable and valid instrument for the measurement of CLE. This scale would assess the factors in the CLE influencing student learning outcomes.

Scale development

Orton's (1981) ward learning climate survey, comprising 124 items rated on a 5-point Likert scale, was selected as the basis of instrument development. The lapse of time since the development of Orton's survey and its application in a different context required adjustments to the instrument. The vocabulary and syntax in the original survey did not always conform to current usage, and some items were inappropriate for use in the present nursing context. In order to more accurately indicate the current nursing education system and terminology, a 12-member panel of expert nurse educators working in the tertiary sector was asked to review the original survey items and indicate any changes, additions or deletions they felt necessary. On the basis of these recommendations, a revised 99-item survey was developed. These items reflected the broad range of issues covered in the original survey, but excluded those items the panel of experts felt were inappropriate or confusing.

In order to focus more clearly on the CLE, the survey was further revised to include only those items which related to the CLE. Items which related to the broader range of issues, for example students' beliefs about the nursing profession, their opinions on education and the learning process, and their preferences for the Organisational arrangements, were excluded. The result was 55 items reflecting the students' perceptions of the realities of the wards on which they undertook their clinical learning experiences.

Sample

The scale was administered during the final 2-week block of clinical placements at the end of 1993. All clinical facilitators ($n = 83$) employed in a school of nursing were invited to participate, and to invite their students to participate. The sample ($n = 423$) was 90% students and 10% clinical facilitators, 87% female, mean age 22.4 years (range 17-52 years), and equally divided over the 3 years of the undergraduate nursing programme.

Procedure

Clinical facilitators were sent an envelope containing a cover letter explaining the pilot study, a code sheet listing the codes for the wards on which their students were undertaking clinical experiences, and a sufficient number of demographic data sheets, CLE scales (CLES), and computer answer sheets for themselves and each of their students.

The facilitators were requested to distribute the surveys and response forms to their clinical groups on the third to last day of the 2-week clinical placement. It was felt this timing would allow the students to have had sufficient time in the placement to have formed an evaluation of the CLE, but would not interfere with student final evaluations. Participation in the study was entirely voluntary, with facilitators free to choose not to distribute the surveys, and students free to choose not to complete them. Completed surveys were placed together in an envelope and returned to the school of nursing by the facilitator. Consent was assumed with return of the responses. All data was anonymous, with no master list of participants kept.

Results

A decision was made to use both exploratory and confirmatory factor analytic techniques in order to develop the most reliable and valid instrument possible. Factor analysis is a statistical technique used

to identify groups of items that represent characteristics of an underlying variable which cannot be measured directly (Norusis, 1990). Exploratory factor analysis (EFA) seeks to identify factors on the basis of strong relationships between items, while confirmatory factor analysis (CFA) compares the goodness-of-fit of a model for a scale derived from a theory or hypothesis to the data obtained. Thus, EFA moves from data to factors and hence to theory, whereas CFA moves from theory to factors to data.

Exploratory factor analysis

Principal component factor analysis with orthogonal rotation was performed on the 55-item CLES using the Statistical Package for the Social Sciences (SPSS Inc., Chicago). Orthogonal rotation is useful in enhancing the interpretability of factors through simplifying the loading patterns. More items have high loadings on only a few factors, with lower loadings on the remaining factors. Orthogonal rotation is appropriate when factors are hypothesized to not be correlated (Norusis, 1990). There was no evidence to suggest that the factors identified in this study would be highly intercorrelated.

Eigen values greater than 2.00 were obtained for five factors, which accounted for 34.6% of the total variance. An Eigen value of 2.00 was selected rather than the more common 1.00 as the large number of factors with Eigen values greater than 1.00 ($n = 31$) resulted in non-meaningful and unmanageable data. Scree testing yielded four major factors, and four factors had four or more items loading above 0.4. Items that did not load on any factor at 0.4 or greater, or which loaded at 0.4 or greater on more than one factor, were deleted (Comrey, 1988, Stevens, 1986). Based on these results, further principal component factor analyses with orthogonal rotations were performed extracting four and five factors. The items within each factor in the four-factor and the five-factor solutions were examined for logical consistency, to determine if each item related to and measured the same construct. Through this subjective evaluation of face validity, the four factor scale was selected as demonstrating greater interpretability and meaning. Reliability coefficients were calculated for each item in the four subscales, and for each subscale. The results are presented in Table 1.

Insert Table 1 EFA loadings and reliability coefficients

Confirmatory factor analysis

In order to evaluate the applicability of CLE theory to the current nursing context, CFA using SPSS LISREL (Joreskog & Sorbom, 1988) was also conducted. A literature review of Organisational, educational and nursing environment theory was conducted to identify those factors most frequently identified with CLE.

As a result of the literature review, a seven-factor model using 34 items from Orton's (1981) survey was initially derived for testing. These factors were chosen through the subjective assessment of their relationship to the current context of nursing education, and their frequency and predictive value in the literature. They included 'commitment to teaching', 'structure of teaching', 'relationship between the clinical area and the university staff', 'relationship between clinical and university content', 'patient care', 'ward relationships', and 'student satisfaction'. CFA was performed using the SPSS.

Initial estimates were computed by the two-stage least-squares method and the final solution by the maximum likelihood method. Items loading with less than 0.4 on the maximum likelihood lambda \times were deleted from further analysis, as were items with squared multiple correlations of less than .25, as these are the least reliable indices of the subscale variables. Using the goodness-of-fit index (GFI = 0.74), the adjusted goodness-of-fit index (AFGI = 0.69), and the root mean-square residual (RMSR not calculated) as indicators (Byrne, 1987), it was apparent that the factors did not satisfactorily explain the variation in the survey data and an alternative model that fit the data better was sought.

The scale was reviewed for alternative combinations of items that might more accurately represent the key factors identified in the literature. The items in the seven factors were refined, and recombined into five factors, merging the areas of commitment to teaching and structure of teaching

into a single factor 'staff-student relationships', merging the two factors reflecting the relationships between the clinical area and the university into a single factor, combining the patient care and ward relationships factors into 'teaching triad', and creating a new factor specific to the influence of the nurse manager, 'nurse manager role'.

A further CFA was performed on the five-factor scale. The items in the subscale 'relationships between the university and the clinical area' continued to demonstrate low lambda x and squared multiple correlations and the subscale was deleted. The correlations between items in the 'staff-student relationships' and 'teaching triad' factors showed some alternative arrangements that were compatible with the theoretical framework, and the assignment of items within those two factors was improved. Confirmatory factor analysis was performed on the refined four-factor scale. The results were: GFI 0.84, AGFI 0.80, RMSR 0.09.

Statistical manipulation

In a final statistical manipulation designed to coalesce the EFA and CFA analyses, the factors obtained through each process were compared and contrasted. Although most of the factors demonstrated commonality, the factor 'interpersonal relationships' was not represented in the four-factor CPA. This subscale was added to those obtained from the CFA, the results examined for the criteria described above and modified accordingly, and the final five-subscale instrument derived (Table 2).

Insert Table 2 Clinical learning environment scale CFA loadings and reliability coefficients

Discussion

The CLE encompasses those forces and elements in the clinical setting that impinge on and influence the student's learning outcomes. These forces may include elements of structure, organization and attitudes. They interact dynamically, and together act to focus and modify the clinical experience such that the learning outcomes will be unique for each individual.

The CLES is a 23-item instrument with five subscales: staff-student relationships, nurse manager commitment, patient relationships, interpersonal relationships, and student satisfaction. These factors have strong substantive face validity and construct validity as determined by CFA. Reliability coefficients range from high to marginal.

Items drawn from an existing instrument may perpetuate existing biases and limitations (Fanshawe & Burnett, 1991). However, comparison with a variety of scales and the literature demonstrates the initial scale items used in this study represented a broad range of content areas identified as relevant and predicative of the clinical learning environment. The methodological processes by which the final instrument was derived offer strong confidence in the construct and face validity of the instrument, and the internal reliability is good.

Further studies are needed to determine concurrent, predictive and discriminant validity.

Conclusion

Thoughtful and well-informed development of the CLE will enhance the student's learning opportunities and facilitate the achievement of optimum learning outcomes. In order to begin this process, it is essential to have a good understanding of the characteristics that describe the environment and the factors most predictive of student learning outcomes.

The development of a valid and reliable instrument is needed to enable the clinical educator to evaluate relevant factors affectively in the CLE, direct resources to areas where improvement may be required, and nurture those areas functioning well. The CLES provides the educator with such a tool. It will assist in the application of resources in a cost-effective, efficient, productive manner and will ensure the clinical learning experience offers the nursing student the best possible learning outcomes.

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Table 2 Clinical learning environment scale CFA loadings and reliability coefficients

Item	1	2	3	4	5	Alpha
All staff on the unit, from the CNC to the newest student, feel part of a health care team.	0.698					
In planning the shift, allowance is made for postgraduate nursing students to gain the widest possible experience.	0.638					
This was a happy ward for both patients and nurses.	0.754					
I did not feel I was treated as an individual, but rather as 'just another student'.	0.612					
We are generally able to ask as many questions as we want to.	0.609					
Our questions were usually answered satisfactorily.	0.654					0.77
The NM devotes a lot of her/his time to teaching nursing students		0.924				
The NM has a teaching programme for students on this ward		0.761				
The NM attaches great importance to the learning needs of nursing students.		0.761				
The NM here was too busy with more important matters to be able to spend time with us.		0.595				0.80
Patient allocation, rather than task allocation, is the practice on this ward.			0.576			
Nursing care is individualised for each patient on this ward.			0.729			
The patients' needs really are given first priority.			0.651			
Learning aids such as books/articles are available to nursing students on this ward.			0.539			0.63
This was a good unit for my learning.				0.900		
The work I did was mostly very interesting.				0.892		
I am happy with the experience I have had on this ward.				0.944		
This experience has made me more eager to become a Registered nurse.				0.588		0.85
The NM does not usually explain instructions coming from a higher level to Registered Nurses.					0.552	
Nursing students learn more from other students on the unit than from the nursing staff.					0.615	
Nursing students are expected to obey Registered Nurses' instructions without asking questions.					0.530	
There is too much ritual on this ward.					0.646	
The NM regards the nursing student as a worker rather than as a learner.					0.638	0.70

GFI 0.86; AGFI 0.82; RMSR 0.07