Nurse Education Today 37 (2016) 83–90

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/nedt

Randomized comparison between objective-based lectures and outcome-based concept mapping for teaching neurological care to nursing students

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ARTICLE INFO

Article history:
Accepted 18 November 2015

Keywords:
Neurological care
Outcome-based education
Concept map
Cognitive load
Nursing competency
Nursing students

SUMMARY

Background: Pre-registration programs have been found to insufficiently prepare nurses for working in the neurosciences specialism. Effective approaches to neurology education are important, not only to enhance motivation to learn, but also for learners to develop basic competence in handling patients with neurological problems.
Objectives: To demonstrate that outcome-based course design using concept mapping would bring about significant differences in the nursing students' competency, cognitive load, and learning satisfaction with the neurological care course.
Methods: A two-group pretest and post-test experimental study was administered. Two of the four clusters of participants were randomly assigned to the experimental group for experiencing an outcome-based course design using concept mapping, and the rest were designated the control group to be given objective-based lectures only. The Competency Inventory of Nursing Students, Cognitive Load Scale of Neurological Nursing, and Learning Satisfaction Scale of Neurological Nursing were used in this study for the students to rate their own performance. In addition, The Concept Map Scoring Scale was used in the experimental group for examining students' concept mapping ability.
Results: Significant increases of mean nursing competency scores in both groups from pre-test to post-test were found. There was no statistically significant difference in mean nursing competency score between the experimental group and the control groups at post-test. The mean cognitive load score of the experimental group was lower than the control group at post-test. The mean learning satisfaction scores of the experimental group were higher than the control group.
Conclusions: This article provides that outcome-based concept mapping as educational method could encourage a group of nursing students to take a bio-psycho-social approach to medicine, which might ultimately result in better nursing care quality.

Introduction

Nervous system diseases such as cerebral vascular accident (CVA) are frequently found to be the third leading cause in the top ten causes of death (Department of Health, 2011). On average, one in every six people is either diagnosed with CVA (Taiwanese cerebral paralysis academic association, 2012), or affected with problems such as head injury, brain tumor, headache, dementia, and spinal cord injury. The number of patients diagnosed with nervous system diseases increases year by year, and patients have been known to suffer impairment in activity, speech, swallowing, cognition, or breathing (Skelly et al., 2012). Patients with various acute or chronic neurosurgical diseases have multiple physical, psychosocial, and spiritual needs (Chahine et al., 2008). Effective approaches to neurology education are important, not only to enhance motivation to learn, but also for learners to develop basic competence in handling patients with neurological problems (McColgan et al., 2013).

Medical care for patients with neurological disorder involves not only treatment of injuries but also predictions and treatment of potential long-term disability (Smith, 2006). A large proportion of stroke patients live with residual deficits and disability (Volpe, 2001). Complex neurological conditions, similar to other long-term illnesses, affect the relationship between the affected person and relatives (Jumisko et al., 2007) and also the relationship between the affected person and the nurses. From the care perspective, people with complex neurological conditions should be viewed in terms of their wellness, or functional

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http://dx.doi.org/10.1016/j.nedt.2015.11.032
0260-6917/

ability, rather than their disability (RCN (Royal College of Nursing), 2007). Pre-registration programs have been found to insufficiently prepare nurses for working in the neurosciences specialism (Cook and Braine, 2013). Pre-registration student nurses benefit from an introduction to neuroscience nursing in their training (Eberhardie, 2009) including common neurological diseases, pathophysiological processes of diseases, ongoing management, continuing health care, and end-of-life care (Peel et al., 2014).

McColgan et al. (2013) describe how a comprehensive systemic review has provided very little high quality evidence of demonstrably effective neurology education. One of the goals of innovative neurology teaching will be an expanding evidence base for enhancing learning outcomes and reducing neurophobia (Ridsdale et al., 2007). Concept mapping is a constructivist teaching strategy considered valuable particularly for subject areas or concept-based learning that are complex or ill-structured (Novak and Cañas, 2007). Within recent years, there has been an increasing interest in concept mapping as a powerful tool to educate new knowledge (Saeidifard et al., 2014). Many studies show that concept mapping can improve learning outcomes (Moattari et al., 2014; Saeidifard et al., 2014; Vadlapatla et al., 2014). Concept mapping helps students integrate their basic knowledge and realize new information they learn (Williams, 2004). Clinical concept mapping is a valuable strategy for improvement of critical thinking of nursing students (Moattari et al., 2014) and can enhance students' reasoning ability (Luckowski, 2003). In addition, it is a useful tool for integrating instructional concepts in a pharmaceutics course for pharmaceutical students (Vadlapatla et al., 2014) and medical students using concept mapping outperformed those in the traditional didactic program (Surapaneni and Tekian, 2013).

Although the positive effect of using concept mapping in nursing education has been discussed previously, it seems that combining outcome-based course design and concept mapping teaching provides theoretical support for enhancing the construction and simulation of neurological care knowledge to develop basic clinical competence. Therefore, there is a clear need for research into the impact of outcome-based course design with concept mapping on student achievement. An outcome-based approach focuses on a systematic, learner-centric conception to quality enhancement and assurance (Deneen et al., 2013). The hypothesis in this study is that outcome-based course design using concept mapping would bring about significant differences in the nursing students' competency, cognitive load, and satisfaction with the course. In this study, students in the experimental group were required to construct a concept map based on a scenario of spinal cord injury client (SCI) using nursing process concept mapping.

Literature

The curriculum explored in this study includes learning aims and objectives and methods of assessment. The learning aims and objectives were selected as they communicate the educational intentions of a course as statements of what the students will achieve (Toohey, 1999). Outcome-based education (OBE) is a performance-based approach at the cutting edge of curriculum development and offers a powerful way of changing and managing professional education (Harden et al., 2012). There are two requirements for OBE. The first is that learning outcomes are clearly defined and presented. The second is that decisions relating to the curriculum are based on the learning outcomes specified (Dent and Harden, 2013). Concept mapping is based on the constructivism theory of learning, which indicates that learning is an active process where students actively construct their knowledge (Novak and Gowin, 1984).

According to assimilation theory, students incorporate information into their existing knowledge frameworks or knowledge schemata (Gerdeman et al., 2013). Based upon the theory of meaningful learning (Ausubel et al., 1978), concept maps are schematic devices for representing a set of concepts in a meaningful framework of proposition (Novak and Gowin, 1984). Constructivism emphasized the conceptual nature of the framework of learning, the need for pre-existing knowledge with which to construct one's own understanding and meaning of new knowledge, and social constructivism addressed the influence of social interactions on the learning process (Canasi et al., 2014). The theory of social learning gives consideration to the type of person students are becoming as a result of their learning experiences (Wenger, 1998). If educators shift their view and focus for learning from cognitive to social, then their way of designing the curriculum will change (Noble et al., 2011).

A concept map developed by an undergraduate student might have simple hierarchical structure with single linkages between structure, process, and outcome (Jamison and Lis, 2014). Concept maps also provide a means to connect and organize links between disease processes, body systems, and physiological effects of disease while providing the guidance for developing a plan of care (Cook et al., 2012). Concept mapping is a tool that can be used not only as a learning tool but also as an evaluation tool where the instructor may identify both valid and invalid ideas held by students (Vadlapatla et al., 2014). A graphic presentation can be used to integrate curriculum knowledge and help students construct their personal knowledge (Chiou, 2008). Therefore, the concept map is ideally suited for constructing teaching materials (Chiou et al., 2015). Very few articles on the subject of outcome-based concept mapping in neurological care have been published.

Methods

Research Design

This was a two-group pretest and post-test experimental study. Two of the four clusters of participants were randomly assigned to the experimental or control groups using SPSS 17.0 statistical software package.

Participant and Setting

The sample was a purposive sample of 213 sophomore college nursing students enrolled in medical or surgical curriculum provided at a vocational university in northern Taiwan who were willing to participate in the study. Sample size calculations were performed using G*Power 3.1 ($\alpha = 0.05$, $\beta = 0.8$, effect size $= 0.5$). A two-tailed independent t test increased attrition by 5% (Faul et al., 2009). A modest incentive (NT$ 200 or 300 in cash) was provided to nursing students for their participation. Fig. 1 is a flow diagram to report the progress of participants through a randomized control trial. (Insert Fig. 1 here).

Intervention

The experimental group (Classes A and B) was exposed to outcome-based neurological nursing training using concept mapping. The control group (Classes C and D) was exposed to objective-based neurological nursing training (Harden et al., 1999; Spady, 1994). Students in both groups completed 12 h of neurological nursing education separately, including 4 h of laboratory exercises. Training objectives, delivery strategies, and training outcome assessment methods were presented in Table 1. (Insert Table 1 here).

Instruments

Assessment instruments used in this study were given in Table 2. Basic information and learning experience surveys were administered to understand the subjects' age, gender, education, work experience, academic performance of the previous semester, previous experience with concept mapping, and previous experience with simulation-based training.