



ELSEVIER

# Matching purpose with practice: Revolutionising nurse education with mita

Margaret Denny <sup>a,\*</sup>, Ellen F. Weber <sup>b,1</sup>, John Wells <sup>a,2</sup>,  
Olga Redmond Stokes <sup>a,2</sup>, Paula Lane <sup>a,2</sup>, Suzanne Denieffe <sup>a</sup>

<sup>a</sup> Department of Nursing, Waterford Institute of Technology, Cork Road Campus, Waterford, Ireland

<sup>b</sup> Director of MITA Center for Brain Based Education Renewal, P.O. Box 347, Pittsford, NY 14534, United States

Accepted 6 March 2007

## KEYWORDS

Multiple intelligence teaching approach (MITA); Multiple intelligence (MI); Nurse education

**Summary** Multiple intelligences have only recently entered the teaching dialogue in nurse education and research. It is argued that despite the rhetoric of a student centred approach nurse education remains wedded to conventional teaching approaches that fail to engage with the individual and unwittingly silence the student's voice. This paper will examine the concept of multiple intelligences (MI) and outline Gardner's contention that the brain functions using eight intelligences which can be employed to improve learning at an individual level. It will then outline the use of MI using a five phase model, developed by Weber, known as a multiple intelligence teaching approach (MITA). It is contended that MITA has great potential in nurse education, particularly in terms of reinforcing learning beyond the educational domain and into the individual's professional development and clinical practice.

© 2007 Elsevier Ltd. All rights reserved.

## Introduction

Changes in nursing curriculum delivery, for example, problem-based learning (PBL), enquiry based

learning (EBL), clinically located learning and multi-disciplinary learning would seem to indicate that nurse education is proactively engaged in change. Whilst this may be true at a strategic level, whether it translates at the interface between student learning and teaching approaches is open to question. This paper proposes that the adoption of a multiple intelligence teaching approach (MITA) will translate the rhetoric of student centeredness into a practical teaching strategy of engagement with the individual nursing student.

\* Corresponding author. Tel.: +353 51 302816.

E-mail addresses: mdenny@wit.ie (M. Denny), eweber1@frontiernet.net (E.F. Weber), jswells@wit.ie (J. Wells), olgar-edmondstokes@wit.ie (O.R. Stokes), plane@wit.ie (P. Lane), sdenieffe@wit.ie (S. Denieffe).

URL: <http://www.mitaleadership.com> (E.F. Weber).

<sup>1</sup> Tel.: +1 585 421 3656.

<sup>2</sup> Tel.: +353 51 302816.

## A holistic approach to education in nursing: the use of multiple intelligences

For the last 25 years nursing has taken as its overall philosophy the concept of holism (Lane et al., 2005; Kobert and Folan, 1990). Nursing's remit, in line with this more holistic view, has also expanded to encompass concepts of clinical specialism and independent/autonomous practice (The Commission on Nursing, 1998). Many studies and reports emphasise that nurses need to develop analytical and conceptual skills in order to be confident clinicians and contributors to practice within its broadest sense and to the strategic development of health services in general (Ferguson and Day, 2007; Cody, 2002; Cowman, 1998; The Commission on Nursing, 1998).

However, curiously, one might argue that whilst the agenda is imaginative and ambitious, the educational methods employed to achieve it have often remained narrowly confined to traditional teaching and assessment approaches, with students as passive recipients of knowledge. This is true even when the rhetoric of educational practice emphasises student involvement in the curriculum through commitment to a *student centred approach*, since this refers to a student input into what will be taught rather than how it will be taught. The educational limitations of this approach in terms of professional outcomes and the ability of nurses to contribute to the health care agenda can be gauged by the number of reports on the failure of nurses to utilise research to inform their practice (Thompson et al., 2002; Retsas and Nolan, 1999). This is despite a professional and educational emphasis on the importance of evidenced based practice and mastering research skills (Ferguson and Day, 2007; The Commission on Nursing, 1998).

Therefore, it would appear that educational approaches in nursing need to be reviewed in terms of the outcomes they achieve in the real world, rather than in the narrow confines of curricular activity. Central to this is the question – how do we successfully engage students in learning so that it is reinforced and generalised beyond the educational experience? In a profession that embraces holism as the cornerstone of practice perhaps the answer lies in also adopting a holistic approach in education. In this regard the work of Gardner (1983) on MI and Weber (1997) on multiple intelligence teaching approaches may be of value.

In 1983, a developmental psychologist, Howard Gardner, put forward his theory of MI. He theorised that individuals have multiple intelligences rather

than a single intelligence and the potential exists to harness and develop all intelligences. Gardner described eight equal and autonomous intelligences (Gardner, 1983, 1987). The multiple intelligences he proposed were linguistic, spatial, logical mathematical, musical, naturalistic, bodily kinaesthetic, intrapersonal and interpersonal. He also suggested that there may be other intelligences such as spiritual and existential.

MI theory proposes that individuals are born with an individualised combination of intelligences. Linguistic and logical-mathematical are usually dominant with the other types of intelligences being recessive (Gardner, 1993). Gardner (1983, p. 9) suggests that these intelligences:

...typically work in harmony, and so their autonomy may be invisible. But when the appropriate observational lenses are donned, the peculiar nature of each intelligence emerges with sufficient clarity.

Hence, he asserts that the conscious brain utilises multiple forms of intelligence processed in different parts of the brain (Gardner, 1983). The challenge posed is *how best to take advantage of the uniqueness conferred on us as a species exhibiting several intelligences* (Gardner, 1999, p.44). Traditional modes of instruction mainly meet the needs of students with verbal-linguistic and logical-mathematical intelligences. The purpose of higher education is to facilitate learning, personal and professional growth using a range of educational strategies. The interaction that takes place between student and lecturer is fundamental to the overall success of this goal. *Since teaching without learning would be pointless, working to improve teaching is the key* (Duff et al., 2000, p.13).

To date, teaching has mainly focused on knowledge acquisition. Consequently, emphasis has been placed on memorisation, repetition and a degree of rote learning. By modifying existing teaching approaches, MI can facilitate instructional environments where students' and lecturers' dominant intelligence can be harnessed and recessive intelligences can be activated to enhance understanding and learning (Gardner, 1993). How best may MI be captured in response to the learning needs of adults in contemporary education?

It is proposed that andragogical styles of learning and teaching have more to offer to contemporary educational developments (Knowles, 1970). MI facilitates student motivation and learning in the classroom and beyond. Ellen Weber's Multiple Intelligence Teaching Approach (MITA) model began from joint projects among teachers,

researchers and secondary students at one large urban high school in 1991 and expanded as a tool for learning reforming in secondary schools and universities around the world. MITA and PBL remain relatively new (see Weber, 1999; Segers et al., 2003; Sanson-Fisher et al., 2005; Gijbels et al., 2005). PBL was birthed in a medical school at McMaster University, and the first class using PBL graduated in 1972 and since then this approach spread to many medical and health related programs schools across North America (Neufeld and Barrows, 1974; for review Choo et al., 2004).

The implementation of MITA incorporating Gardner's (1983) vision of a wider family of intelligences in third level institutions challenges traditional teaching approaches. Even when third level institutes of education engage in innovative approaches such as PBL, they fail fully to evaluate/explore its implications in terms of effective learning and delivery. Sanson-Fisher et al. (2005) highlight the increasing use of PBL in undergraduate medical education; however, it is resource intensive and is synonymous with small group learning.

### Mita as a model to enhance student learning

Research evidence shows that students understand deeply when they investigate authentic problems rather than simply reciting back isolated facts on standardised tests (Boyer, 1987) MITA incorporating problem-based learning scenarios and has the potential to facilitate deep approaches to learning (Biggs, 2003). Cowman's (1998) research findings support the contention that student nurses adopt a deep approach to learning when they are motivated and have a genuine interest in the subject content, whereas, those who are disinterested in the subject content tended to adopt a surface approach to learning. MITA facilitates a climate where students think critically and creatively, and are empowered to generalise learning to clinical practice (Weber, 1997, 1999). The MITA model (Table 1) consists of a five phase strategy to facil-

itate students' learning through engaging their strengths, both individually and in collaboration with others (Weber, 2005).

In each case this five phase model relies on MI theory and constructivist teaching and learning approach, as put forward by von Glasersfeld (1995). Constructivism, which is a theory of learning, asserts that students create knowledge, based on their current and past knowledge, rather than merely receiving and storing information that is transmitted by the lecturer (based on developmental theories-Piaget, 1972; Vygotsky, 1978). Learning is therefore an active process. Weber's (1999) practical model addresses intellectual diversity through engaging students actively in structured PBL tasks using a MITA approach. MITA is like a hologram with three distinctive images or functions, for instance, through MI ideas, students engage talents and interests, through constructivist ideas students mine their past knowledge and experiences and through MITA ideas students dare to risk extended possibilities for problem solving (Weber, 1999).

At the core of this model is the human brain's optimum potential for success (Pool, 1997) when brain-based practices are used for teaching/learning and assessment. This is in keeping with MITA's pattern to extend theory into practice and to inform practice with theoretic principles. MITA's five phases provide structure that begins on day one of the learning experience. MITA's phases are rooted in significant facts about the human brain, as explored by Gardner (1983) and Caine and Caine (1991). The model's first phase responds to the fact that a search for meaning is innate in human brains (Weber, 2005). Phase two relies on the fact that learning is enhanced by challenge and inhibited by threat (Weber, 1999). Phase three addresses the fact that learning is developmental. Phase four recognises the fact that each human brain is both individually different and uniquely wired (Caine and Caine, 1991). Phase five rests on the premise that the brain/mind is a complex dynamic system (Weber, 1999).

In one way, the model reaches forward to include new facts about the brain's optimum capacity to learn well (Sylwester, 1995). It enables lecturers to create innovative curriculum tasks that challenge and activate students in higher education classes (Chickering, 1995). In another way, this model (Table 1) reaches back to adapt to a problem-based approach to learning, grounded in constructivist and multiple intelligence theory (Weber, 2000). These resulting brain-based approaches to learning enhance PBL and EBL because of the strong connection to students' strengths and interests (Fogarty, 1991).

**Table 1** MITA five phase model

<i>MITA's five phases (Weber, 1999)</i>	
Phase-1	Question possibilities
Phase-2	Target improvements
Phase-3	Expect quality
Phase-4	Move resources
Phase-5	Reflect on growth possibilities

## Mita phases

In order to clarify the MITA five phase model, an illustration germane to intellectual disability curriculum content (mental health problems in intellectual disability) is used. In phase one (Table 2) MITA inquiry adds dialogue for a problem solving roundtable discussion (Lieberman, 1992; Weber, 2005), using a two-footed question approach that links critical inquiry to content and experiences. Weber (2005, p.12) posits that "two-footed questions address students' interests and abilities as well as learning expectations from the [curricula] content and ... provide opportunities for students to probe content more deeply".

In MITA phase two (Table 3) targets are set that guide students past the problem to consider possible solutions. This phase is similar to *Maastricht seven jump sequence* that is used to structure PBL problem case scenarios (see Dammers et al., 2001; Barrows and Tamblyn, 1980).

In MITA phase three (Table 4) scoring criteria or rubrics are created, which guide students through learning tasks and these same criteria become the checklist for lecturer assessment of students' work.

MITA's fourth phase (Table 5) offers learning and assessment tasks, using students' multiple intelligences as tools to present authentic

solutions. MITA's tasks connect students' interests and abilities to curriculum requirements in order to resolve practice issues (Jacobs Hayes, 1989).

Finally, MITA phase five (Table 6) students and lecturers reflect on knowledge gained and on the learning process itself. Using a reflective phase accommodates and encourages student participation and motivates disengaged students. Students explore ways to draw upon hidden or unused mental resources; explore course topics for deeper understanding; and integrate several fields of science as an approach to solve complex problems or handle emergencies.

MITA's five phases can be used in a one hour lecturer or over a number of lectures on the same subject. However, in phase five the lecturer may decide to use only two or three of the MI's identified. Weber (2005) stresses the importance of using the five phase approach and asks rhetorically how MITA will guarantee that growth and challenge continue to occur in nurse education?

Thus, it is essential that all phases of MITA are used during the learning experience. In phase 2, for example, if targets are not set for students then confusion is created and if scoring criteria or rubrics are not created (phase 3) sloppiness is the result. Similarly, if students are not moved (phase 4) to use all their intelligences waste is the result

**Table 2** Phase I – two-footed question

- 
- What is mental health (module topic) and how have you observed it expressed normally and abnormally (your personal experiences)?
- 

**Table 3** Phase II – target: learning outcomes for this lesson

- 
- Discuss the concepts of abnormal and normal behaviour patterns and describe how mental health problems may manifest in persons with varying degrees of intellectual disability
  - Describe the signs and symptoms of mental health problems in people with intellectual disability
  - Discuss the concept of dual disability
  - Evaluate interventions used in the treatment of mental health problems in people with intellectual disabilities
  - Implement a plan of care for a person who has an intellectual disability and a mental health problem
- 

**Table 4** Phase III - expect – scoring criteria shows what is expected in this lesson

- 
- Research on latest information on mental health problems in people with intellectual disabilities
  - Every team member contributes information regarding an assessment tool used to diagnose dual disability
  - Each team member shares specific findings on incidence and prevalence of dual disability in people with intellectual disabilities
  - Evidence from research about interventions used in the treatment of dual disability
  - A spatial diagram representing the 'Promotion of Mental Health' in people with intellectual disabilities
-

**Table 5** Phase IV - move – Students use their multiple intelligences

Group	Two-footed questions	Measurable targets	Assessment task ideas
1-Math	How often and how are people with abnormal behaviours helped to lead normal lives and how can you tell?	<ul style="list-style-type: none"> <li>• Graph clients' rate of independence following intervention</li> </ul>	Graphs, statistics, timelines, ratios, numeric, cause and effect, problem solving
2-Music	How do you observe music's impact on a person's mental process for normal and abnormal behaviour?	<ul style="list-style-type: none"> <li>• Compose song to motivate tasks</li> <li>• Present music to move</li> <li>• Depict abnormal behaviour through music</li> </ul>	Compositions, background music, rhythms, integrate music and learning, music video, solo, duet, interpret health through music, demonstrate music as it moves the brain waves
3-Intra	What are the lived experiences of people who are mentally challenged and how can you as person help these people?	<ul style="list-style-type: none"> <li>• Publish one personal intervention story</li> <li>• Express lived experience of a client</li> <li>• Journal as an ID client might</li> </ul>	Journal, personal reflections, personal quotes, legacy, ethical choices, personal role model, assume roles of another, personal stories, personal target-setting, personal change agents
4-Inter-	How have you engaged people who present abnormal behaviour patterns and what has been the outcome?	<ul style="list-style-type: none"> <li>• Interview people re: contentment</li> <li>• Teach peers through case or vignette</li> <li>• Collaborate to share success outcomes</li> </ul>	Shared stories, collaboration, interviews, surveys, team teaching, character descriptions, proofread, mentoring and being mentored, compete in teams
5-Kinisth	How can you express mental health patterns through movement?	<ul style="list-style-type: none"> <li>• Lie in unsafe mental health posture</li> <li>• Create a dance/play/that captures mental wellbeing</li> </ul>	Choreographed dance, tableau, buildings, and travel to centre, design outdoor living sites, produce a play, use body language, and create sports for normal and abnormal behaviour
6-Natural	What does nature offer to improve your mental health and behaviour patterns for all persons'?	<ul style="list-style-type: none"> <li>• Accompany a person with intellectual disability on natural outing</li> <li>• Recreate relaxed natural setting</li> <li>• State nature's message to mental health</li> </ul>	Compare and contrast natural settings, research and demonstrate nature's effect on mental health, experiment with nature, contrast nature in past and today, illustrate natural phenomena
7-Spatial	How can mental health be illustrated pictorially and with what effects on a person's mental development?	<ul style="list-style-type: none"> <li>• Create book without words</li> <li>• Etch a disturbed development</li> <li>• Build mobile of person's mental development</li> </ul>	Design a poster on mental health, paint, show adjustments to a setting, draw, create patterns for three-D projects, create posters to show multiple perspectives, display bulletin boards, design webpage
8-Linguist	How would you use words to describe abnormal & normal behaviours and add recommendations?	<ul style="list-style-type: none"> <li>• Read poem that expresses intervention</li> <li>• Create a case or vignette</li> <li>• Write a disturbed letter to a friend</li> </ul>	Write stories, poems, interview an expert, debate two sides of the issue, lecture peers, read chorally, design a book of comparisons, write a letter to the editor of local news paper with recommendations for positive mental health approaches

**Table 6** Phase V - reflect

Reflect Based on today’s session how will this information on dual disability help you as an intellectual disability nurse in your practice

**Table 7** Where do you see your students in relation to MITA’s growth?

Phases	1	2	3	4	5
(Ideal)	Question	+ Target	+ Expect	+ Move	+ Reflect = Growth
	Question	+ ↓	+ Expect	+ Move	+ Reflect = Confusion
	Question	+ Target	+ ↓	+ Move	+ Reflect = Sloppiness
	Question	+ Target	+ Expect	+ ↓	+ Reflect = Waste
	Question	+ Target	+ Expect	+ Move	+ ↓ = Stagnation

© Ellen Weber, 2005.

and if reflection is not part of the learning activity (phase 5) stagnation occurs (Table 7).

### The outcome of learning

Together MITA and PBL combine four features that lead to the presentation of knowledge: (1) they both start with a question or problem to generate curiosity and in order to gain deeper understanding of complex issues; (2) lecturers function as facilitators rather than disseminators of facts; (3) learning outcomes are holistic rather than narrowly based in any one discipline; and, (4) assessments are authentic, performance based, and varied according to the outcomes required to solve particular problems (Weber, 2005). Structure comes through MITA’s five phases that culminate in a presentation of knowledge. For example, during the presentation of knowledge, which epitomises learning achieved by students for a particular module, students may decide to invite colleagues, academic staff, health service staff and the wider community and engage together in an interactive problem solving dialogue in order to disseminate and share the learning that has occurred.

### Mita: The challenges for nurse education

Implementation of MITA, into existing higher education programmes, is not without challenges (Ford et al., 1996). Given the formation of higher level nursing curricula programmes, standardised college requirements and conservative teaching, some academic departments are understandably

reluctant to risk new methods and or unfamiliar methods of learning and teaching (Chapman et al., 1996). Central to implementing MITA problem solving and knowledge learning approaches is the willingness to explore and embrace a change agenda that is beyond rhetoric, but rooted in meaningful redesigned higher nurse education change. Nursing, a notoriously conservative profession, will be challenged by this approach. However, failure to explore innovative approaches in nurse education will only serve to ensure the latter view. MI approaches using MITA will not supplant lecturer involvement but ensure collaborative, student focused and facilitated learning in the classroom and beyond. At the core of MITA innovations is measurable evidence of solutions that draw from both course content and problem solving acumen. Students in a MITA classroom are not viewed as blank slates because the lecturer promotes an active learning environment that connects students’ prior experiential knowledge to curriculum content. Mansouri et al. (2006) posit that factors such as active learning, internal motivation, problem-based teaching should bring about improved outcomes in nurse education and they further suggest that every effort should be made to invest in new methods of teaching.

PBL educational programmes/curricula can use MITA as a way to motivate students, to enhance authentic problem solving techniques beyond the classroom and enable learners to critically think, use independent inquiry skills and evidence-based practice to solve complex case problems. Ferguson and Day (2007, p.110) reinforce the notion that “new nurses must also carry into practice the crit-

ical thinking skills and attitude of inquiry learnt in their education programmes''. Kershaw (2004) highlights the importance of identifying and nurturing individual skills and aptitudes in students and equally all their intelligences. In this regard using MITA can inform learning environments with theoretical principles that allow students to utilise all their intelligences when learning. MITA also enables lecturers to extend and incorporate PBL and EBL approaches within nurse education so that students learn critical thinking skills for practice. PBL alone has not always contained the solid structures within which solutions can be evidenced and deep learning achieved (Sanson-Fisher et al., 2005; Biggs, 2003; Weber, 1999). Berkson (1993) notes that strength of PBL approaches is in its active learning approach but the debate continues as to whether lecturers are required to be subject matter experts. Importantly, lecturers using a MITA approach can be trained at basic or advanced level and so can bridge this vacuum in terms of expertise and the skills required to structure a MITA class. Presently, MITA approach has also been used to structure EBL and PBL in several courses at McGill, University of Toronto, University of British Columbia, York University, Universities in China, South America, Mexico and in several other countries. In Ireland, Waterford Institute of Technology (WIT) is the first academic organisation to use this innovative approach in nurse education programmes. Presently, a research study at WIT examines how a teaching/learning intervention using a MITA approach offers a powerful means of initiating change within an integrated studies context (Denny, 2006).

## Conclusion

It has been argued that MITA is a teaching and learning approach that facilitates all learners, regardless of ability, and one that encourages active uptake of knowledge in the classroom and beyond. Using a MITA approach ensures the advancement of new innovative approaches to teaching and learning in undergraduate nurse education. MITA offers many prospects for students to collaboratively share and examine curriculum content using a five phase approach that utilises all their intelligences. Active engagement of students in higher education classes is to understand and interact within their unique worlds, which includes, social situations nursing/medical emergencies, where effective problem solving is required. When educators hold students' interests and focus on their abilities, motivation for learning is en-

hanced (Weber, 2005; Denny, 2006; Maslow, 1970). As the use of MITA approaches expands in higher nurse education programmes, students move from being passive recipients of knowledge to proactive contributors to knowledge and critical problem solving. Teaching for learning using brain-based approaches, such as MITA, is one means through which individualised education can be realised.

MITA adds specific challenges at first, especially to academic staff who lecture only, but this student-centered holistic approach soon opens new conversations at academic fora. While curricular change may be uneasy at first, it can be liberating and revolutionary for progressive thinkers with a vision to spark transformational change in order to achieve excellence in nurse education.

## References

- Barrows, H.S., Tamblyn, R., 1980. *Problem-Based Learning: An Approach to Medical Education*. Springer, New York.
- Berkson, L., 1993. Problem-Based Learning: Have the Expectations Been Met? *Academic Medicine* 68, S79–S88.
- Biggs, J., 2003. *Teaching for Quality Learning at University*, second ed. Open University Press, Buckingham.
- Boyer, E., 1987. *College: The Undergraduate Experience in America*. Harper and Row, New York.
- Caine, R.N., Caine, G., 1991. *Making Connections: Teaching and the Human Brain*. Addison-Wesley, Menlo Park, CA.
- Chapman, J., Boyd, W., Lander, R., Reynolds, D. (Eds.), 1996. *The Reconstruction of Education: Quality Equality and Conflict*. Cassell, New York.
- Chickering, A., 1995. Considering the Public Interest. *Liberal Education* 81, Part II, Spring, p. 18.
- Choo, K.H., Tong, J.C., Tan, T.W., Ranganathan, S., 2004. Application of Problem Based Learning Pedagogy in Global Online Bioinformatics Education Georgia Tech. Presentation at the Workshop on Education in Bioinformatics. Glasgow, Scotland.
- Cody, W.K., 2002. Critical thinking and nursing science: judgment, or vision? *Nursing Science Quarterly* 15 (3), 184–189.
- Cowman, S., 1998. The approaches to learning of student nurses in the Republic of Ireland and Northern Ireland. *Journal of Advanced Nursing* 28, 899–910.
- Dammers, J., Spencer, J., Thomas, M., 2001. Using real patients in problem-based learning: students' comments on the value of using real, as opposed to paper cases, in a problem-based learning module in general practice. *Medical Education* 35 (1), 27–34. doi:10.1046/j.1365-2923.2001.00841.x.
- Denny, M., 2006. Exploring intelligence theory in the context of teaching and learning in undergraduate nurse education in Ireland. in: *First International Nurse Education Conference*, Vancouver, Canada.
- Duff, T., Hegarty, J., Hussey, M., 2000. *Academic Quality Assurance in Irish Higher Education*. Blackhall Publishing, Dublin.
- Ferguson, L.M., Day, R.A., 2007. Challenges for new nurses in evidence-based practice. *Journal of Nursing Management* 15 (1), 107–113. doi:10.1111/j.1365-2934.2006.00638.x.
- Fogarty, R., 1991. *The Mindful School: How to Integrate the Curricula*. Skylight Publishing, Palatine, IL.

- Ford, P., Goodyear, P., Heseltine, R., Lewis, R., Darby, J., Graves, J., Harwood, D., King, T., 1996. *Managing Change in Higher Education*. Open University Press, London.
- Gardner, H., 1983. *Frames of mind. The Theory of Multiple Intelligences*. Basic Books, New York.
- Gardner, H., 1987. *Beyond the IQ: Education and Human Development – Developing the Spectrum of Human Intelligences*. Harvard Educational Review, 57 (2) President and Fellows of Harvard College: Cambridge, MA.
- Gardner, H., 1993. *Multiple intelligences. The Theory in Practice*. Basic Books, New York.
- Gardner, H., 1999. *Intelligence Reframed: Multiple Intelligences for the 21st Century*. Basic Books, New York.
- Gijbels, D., Van de Watering, G., Dochy, F., 2005. Integrating assessment tasks in a problem-based learning environment. *Assessment and evaluation in higher education* 30 (1), 71–84.
- Jacobs Hayes, H., 1989. *Interdisciplinary Curriculum: Design and Implementation*. Association for Supervision and Curriculum Development, Virginia.
- Kershaw, B., 2004. Educating nursing students as individuals. Guest Editorial. *Journal of Advanced Nursing*, Blackwell Publishing, London.
- Knowles, M., 1970. *The Modern Practice of Adult Education*. Association Press, New York.
- Kobert, L., Folan, M., 1990. Coming of age in nursing. Rethinking the philosophies behind holism and nursing process. *Nursing and Health Care* 11 (6), 308–312.
- Lane, P., O'Brien, U., Gooney, M., Reid, J., 2005. The progression of holism into postgraduate curricula in critical care nursing: a discussion paper, *Dimensions of Critical Care Nursing* 24 (3) pp. 131–138.
- Lieberman, A., 1992. The meaning of scholarly activity and the building of community. *Educational Researcher* (August–September), 5–12.
- Maslow, A.H., 1970. *Motivation and Personality*. Harper and Row, New York.
- Mansouri, P., Soltani, F., Rahemi, S., Moosavi Nasab, M., Ayatollahi, A.R., Nekooeian, A.A., 2006. Nursing and midwifery students' approaches to study and learning. *Journal of Advanced Nursing* 54 (3), 351–358. doi:10.1111/j.1365-2648.2006.0381.x.
- Neufeld, V.R., Barrows, H.S., 1974. McMaster philosophy: an approach to medical education. *Journal of Medical Education* 49, 1040–1050.
- Piaget, J., 1972. *To Understand is to Invent*. Viking Press, New York.
- Pool, C., 1997. Maximizing learning: conversation with Renata Caine. *Educational Leadership*, 11–15.
- Retsas, A., Nolan, M., 1999. Barriers to nurses' use of research: an Australian hospital study. *International Journal of Nursing Studies* 34 (6), 335–343.
- Sanson-Fisher, R.W., Marita, W., Lynagh, C., 2005. Problem-based learning: a dissemination success story. *Medical Journal of Australia* 183 (5), 258–260.
- Segers, M., Van den Bossche, P., Teunissen, E., 2003. Evaluating the effects of redesigning a problem-based learning environment. *Studies in Educational Evaluation* 29, 315–334.
- Sylwester, R.A., 1995. *Celebration of Neurons: An Educator's Guide to the Human Brain*. Association for Supervision and Curriculum Development, Alexandria VA.
- The Commission on Nursing 1998. *Report of the commission on nursing: a blueprint for the future*, Stationery office: Dublin.
- Thompson, C., McCaughan, D., Cullum, N., Sheldon, T., Thompson, D., Mulhall, A., 2002. Nurses' use of research information in clinical decision making: a descriptive and analytical study final report, University of York, York.
- von Glasersfeld, E., 1995. *Radical Constructivism: A Way of Knowing and Learning*. The Falmer Press, Washington, DC.
- Vygotsky, L.S., 1978. *Mind and Society: The Development of Higher Mental Processes*. Harvard University Press, Cambridge, MA.
- Weber, E., 1997. *Roundtable Learning: Building Understanding Through Enhanced MI Strategies*. Zephyr Press, Tucson, Arizona.
- Weber, E., 1999. *Student Assessment That Works: A Practical Approach*. Allyn and Bacon, Needham Heights MA.
- Weber, E., 2000. *Five-phases to PBL: MITA model for redesigned higher education classes. Problem-Based Learning: Educational Innovation Across Disciplines*. Tamasek Center for Problem Based Learning, Singapore.
- Weber, E., 2005. *MI Strategies in the Classroom and Beyond: Using Roundtable Learning*. Pearson Publishers, New York.

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

