ENGAGEMENT THROUGH ANDRAGOGY IN HEALTH CARE EDUCATION

By

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This MA-IS report focuses on teaching and learning as it relates to the Mohawk/McMaster BScN program, particularly the proposed new MRI/fMR stream. Best methodological and philosophical practices for the delivery of the Mohawk/McMaster Magnetic Resonance Imaging program will be proposed in this report. I argue that the learner is best prepared in the requisite knowledge, skills, abilities and attitudes necessary of a health care MRI/fMR graduate via the techniques and methodology of andragogy. Specifically, I propose a “living learning” model of andragogy, which is comprised of Inquiry-based learning, project-based learning, self-directed learning and critical evaluative skills.

This report assumes that the need and intent of the program based on demographic and health industry research is justified. The central focus of this MA-IS report is simply to propose best practices in the methodology and philosophy of education within the health care profession of the proposed Medical Radiation Sciences-Magnetic Resonance Imaging degree/diploma program. Best educational practices and technology must both support and motivate students to continually learn more deeply, and to be prepared for impending responsibilities in the workplace.

The proposed program stream referred to in this report is predicated on the success of the existing Medical Radiation Sciences degree/diploma offering of Mohawk College and McMaster
University. The proposal is strategic to the McMaster University/Mohawk College Health Sciences initiative and positions the centre in a leadership role in Medical Radiation Sciences within Canada. The level one offering of the program offers common curriculum. Level 2 students choose a specialty. The current program offers three professional program specialties in Radiography, Ultrasonography and Radiation Therapy. The addition of a Medical Resonance Imaging (MRI/fMR) stream would provide a fourth option to Medical Radiation Sciences students in level two of the program. Competencies recently developed are available for degree programs of MRI, formerly only available as postgraduate competencies. Government, corporations and clinics have supported the Mohawk/McMaster bachelor degree and it is expected that this will only grow with the forethought of this proposed expanded offering.

MRI/fMR technology offers the best diagnostic test in relation to soft tissue to assess the body for the determination of the presence of disease as it is non-invasive and does not subject the body to ionizing radiation. Further, Nuclear Magnetic Resonance can provide additional information related to tissue/cell physiology and function by Functional MR. The program specialty will afford the learner studies in MR anatomy/pathology and imaging protocol; professional practices, quality assurance; patient and client care; MR system hardware; safety of MRI; contrast media for neuron-radiological applications; physical principles and image quality; and effects of artifact faults.
The challenges and opportunities which face workers in MRI/fMR health care require an ability to think deeply, creatively and critically. I propose that the decision making experienced in the program must emulate the decision-making one engages with in a career of Magnetic Resonance Imaging. In other words, learners must experience “living learning”.

Accordingly, I emphasize the importance of the process of learning over an emphasis on the content offered in any programs curriculum. Certainly, what needs to be known for ones career and service in MRI/fMR and health care grows from basic foundational knowledge. Beyond this base of knowledge, learner centered practice, application, evaluation and synthesis must naturalize through self-directed, problem-based learning in small group interactive settings. The profession demands mature, team oriented practitioners. Graduates must be able to problem solve, think through diagnostics critically and seek out new possibilities to health care through MRI/fMR technologies in both team settings and individually. The proposed program will build from foundational knowledge to eventual self-directed learning later in the program. Thus, the learner will master the application of discipline specific learning competencies and objectives as set by the governing accreditation body.

Rachal (2002: 214) summarizes information from empirical studies in her research that incorporates teacher-determined objectives and content with little to no significant learner input.
The Rachal studies support the use of androgogy as a supplementary mode of learning to pure Self Directed Learning Principles, which augment and complement the basic foundational knowledge with a prescribed set of competencies based on future findings through the use of MRI/fMR technology.

This contrasts with Knowles’ early ideal (1970 through 1984). Most of the studies cited by Rachal involve adaptations and interpretations of such early theory in andragogy. I take similar liberties in my argument concerning competency-centered MRI/fMR health care curriculum that is based on prescribed performance measures because the profession requires critical evaluation and inquiry that makes connections with what is presently known and what is yet unknown. The patient has changed, the practical possibilities of the technology and what it serves has changed and accordingly the knowledge, skills, abilities and attitudes of the potential graduate must follow.

In order to advance my argument, the difference between andragogy and pedagogy must be illustrated. Many definitions of these terms exist. For instance,

“For centuries, the most commonly accepted approach towards teaching and learning was pedagogical in nature. The Greek roots of the word pedagogy are ped or child, plus agogos, which mean to lead. A literal interpretation would be to lead a child. By definition, pedagogy is the art, science or profession of teaching. Andragogy, from the Greek words “anere”, for adult and “agogus”; to lead is then the art and science of helping students learn. Widely used by adult educators to describe the theory of adult learning, the term offers an alternative to pedagogy for some”. The above definition from: http://www.library.yale.edu/training/stod/pedagogy_vs_androgogy.html.
Previously considered definitions of andragogy that suggest best practices supported by this report include:

A need to have a life centered, task centered, or problem centered orientation - Often this requires helping them overcome inhibitions, behaviors, and beliefs about learning. From: www.neiu.edu/~dbehrlic/hrd408/glossary.htm

An educational approach characterized by learner-centeredness (i.e., the student’s needs and wants are central to the process of teaching), self-directed learning (i.e., students are responsible for and involved in their learning to a much greater degree than traditional education), and a humanist philosophy (i.e., personal development is the key focus of education). Related concepts include facilitated learning, self-directed learning, humanism, critical thinking, experiential learning, and transformational learning. From: www.nald.ca/adultlearningcourse/glossary.htm

Certainly, the literature has not settled the debate on pedagogy versus andragogy. Polson (1993), much earlier, asked the question: “Is the ‘adult learner’ a recognizable, single entity for whom there is one best way to teach, or for whom there is one best way to learn? No. There is no agreement in the literature as to what constitutes an adult learner”, a statement with which I agree. Many studies have compared and contrasted the characteristics and approaches of andragogical and pedagogical approaches to teaching and learning, as the table below summarizes.
### Characteristics of the Andragogical and Pedagogical Approaches to teaching-learning

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<thead>
<tr>
<th></th>
<th>Pedagogical</th>
<th>Andragogical</th>
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<tr>
<td><strong>The Learner</strong></td>
<td>- the learner is dependent upon the instructor for all learning.</td>
<td>- the learner is self-directed.</td>
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<tr>
<td></td>
<td>- the learner is dependent upon the instructor for all learning.</td>
<td>- the learner is responsible for her own learning.</td>
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<td></td>
<td>- the teacher/instructor assumes full responsibility for what is taught and how it is learned.</td>
<td>- self-evaluation is characteristic of this approach.</td>
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<td>- the teacher/instructor evaluates learning.</td>
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<td><strong>Role of the Learner's Experience</strong></td>
<td>- the learner comes to the activity with little experience that could be tapped as a resource for learning.</td>
<td>- learner brings a greater volume &amp; quality of experience.</td>
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<td>- the experience of the instructor is most influential</td>
<td>- adults are the richest resources for one another.</td>
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<td>- different experiences assure diversity in groups of adults.</td>
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<td>- experience becomes the source of self-identity.</td>
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<td><strong>Readiness To Learn</strong></td>
<td>- students are told what they have to learn in order to advance to the next level of mastery.</td>
<td>- any change is likely to trigger a readiness to learn.</td>
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<td>- the need to know in order to perform more effectively in some aspect of one’s life.</td>
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<td>- possesses the ability to assess gaps between where one is now and where one wants and needs to be.</td>
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<td><strong>Orientation To Learning</strong></td>
<td>- learning is process of acquiring prescribed subject matter</td>
<td>- learners want to perform a task, solve a problem, and live in a more satisfying way.</td>
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<td>- content units are sequenced according to the logic of the subject matter.</td>
<td>- learning must have relevance to these tasks.</td>
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<td>- learning is organized around life/work situations rather that subject matter units</td>
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### Motivation For Learning

| Primarily motivated by external pressures, competition for grades, and the consequences of failure. |

The above table from: [http://www.library.yale.edu/training/stod/pedagogy_vs_androgogy.html](http://www.library.yale.edu/training/stod/pedagogy_vs_androgogy.html)

**Living and learning from the literature…**

Dependence in learning, to me, is not necessarily co-related to chronological age. Any learner’s experience, need to be self-directing, and interest in life-centered topics is relative and embodies meaningfulness. Children and adults, especially when the subject matter is unfamiliar, prefer to be taught, [directed] or lectured (Knowles, 1990) in a dependent style. As one becomes more familiar with knowledge of a given discipline, I believe, one seeks increasing autonomy and the inspiration to grow in their learning. Therefore, in considering practices for learning and teaching in the proposed program of the BScN MRI/fMR diploma/degree I purport that andragogical approaches are best. Each learning event is more adult like, more involved, demonstrating increasing responsibility and autonomy to career related thinking and behaving as a graduate of a vocational program.
Certainly health care education is standards-driven and specific third-party competencies are tightly scripted. Coercive learning practices, however, stifle potentiality. Facilitators of the learning ought to stimulate social and personal inquiries for better health care and use of MRI/fMR technology and skills. Drayton and Falk (2001) are cited by Kilinc et al (2007: 3) who indicates that classrooms where teachers emphasize Inquiry Based Learning develop learners’ inquiry skills. Alternatively, this type of Inquiry Based Learning, which is cultivated by curiosity and scepticism of commonly held knowledge, is stifled when the learner is required to merely adhere to established pedagogy and skill sets developed by teachers and experts. Inquiry Based Learning, as Drayton and Falk point out, allow the learner to take into account authentic, time sensitive, social and cultural challenges. Kilinc et al recognize the collaboration, the stimulation, and the interactivity necessary to deepen learning for the adult learner.

Discovery and opportunities surface from this sincerity and ownership of the learning, a transformation to new possibilities for MRI technologies and skills. One’s self-concept or awareness and understanding of the world and its challenges help prepare a person for a career. The preparation comes from a true engagement with learning, to my mind. The learner must develop from basic knowledge and techniques and tried and true practice scenarios in the art and science of education. Remarkable transformative learning evolves from a mastery of these basic beginnings. Think of an artist who begins with basic brush techniques and art medium manipulation. Similarly, a beginning scientist follows the basics rules of the laboratory, its
equipment use and scientific equations with known reactions. Learning, exploring and experimenting in the art studio or lab evolves to an art and science of discovery, as accomplishments. Artists evolve to a personal style of expression while scientists discover new connections as learning extends, deepens, grows, connects with prior learning of sound foundational basic learning. Just as thought provoking art evolves from the artist, creative scientific discovery can spring from informed laboratory work. Both begin fundamentally and both engage the learner to seek the inspirations and connections in deeper thought and discovery. Educational process, creativity and criticality then are paramount to health care, a healthful community and successful learning in a healthcare education program.

To summarize, the “pedagog” is more concerned with transmitting content while the “andragog” is “concerned with facilitating the acquisition of the content by the learners” (Knowles, 1996b). Pedagogy continues to speak of mastering content not building skills, abilities and attitudes. The content can be talked about but holds no measure of sequential practice to mastery in cognitive, affective and psychomotor terms. I argue that early basic or foundational learning is best managed in a more controlled pedagogical manner that culminates in integrated and MRI/fMR specialized knowledge with a more self directed andragogical approach. A more controlled facilitator-dominant environment transforms to a self discovery of the learning, contrary to Knowles early theory (1970). A continuum-based rank of teacher control through to student directed learning (Knowles 1980, 1984) suggests an adaptation of andragogy. The result is a
hybrid, phased-in approach to support the increased development and confidence necessary from surface to deep learning. The MRI/fMR learner gains fundamental knowledge and confidence due to increased experience with the competencies and adult learning practice.

Problem-based learning, problem solving and critical integration of curriculum occurs with greater depth throughout the program. Foundational core curriculum, Level One, grounds the learning that develops to complex problem-solving competency in Level Two, Three and Four studies. Interactive simulation of patient cases (ISP) and Clinicals prepare the graduate in self-directedness, independent thought and professional preparedness for MRI/fMR health care. This model of learning with critical reflection and facilitator partnership advantages the learner of health care knowledge and practices as the career that follows formal education incorporates similar patterns of inquiry in the workplace setting. Few cases presented are scripted and predictable, rather, they are context specific and require independent evidence-based decision making. The foundational learning presents common and practiced knowledge and skills while the outreach and Clinical work hopes to stimulate the learner to inquire and problem solve what could be considered for better health care into the future.

Knowles’ (1970:51) early ideal of allowing students to “learn for themselves what they want to learn” was more prescripted through specific pre-determined objectives of learning, more linear in nature, than I propose for the BScN MRI program. “Anaemena (1886), Cartor (1991),
Familoni (1992) Farrar (1991), Madriz (1987), Saxe (1987), Stevens (1986), Strawbridge (1995), and White (1989) all used a relatively prescribed content determined by the instructor in varying degrees of freedom as the means of reaching the objectives” (Brookfield, 1986). Knowles’ view was reflected in earlier iterations of nursing programs as evidenced with Mohawk College’s history in nursing education as early as in Sister Calista Roy’s Theory of Nursing curriculum. (See Appendix 1 for more on this) One can extend this theory and flexibility in the process of learning, particularly to the when and where components I refer to earlier. To me, engagement of the teacher as facilitator well connected with the learner is a true interactive process. The learning event allows the learner to work through to deeper learning and thinking in best applications to construct and deconstruct what is to what can be.

Briton (1996) cites Lindeman, saying that one must deconstruct what is to find better truths in a social process toward social change (1996:3). Deconstruction as a theory of thinking and learning in postmodern resistance is a more constrained ‘sage-on-the-stage’ style teaching methodology. Health care providers, as humanists, interrogate political, economic, social and democratic conditions to advocate for equitable health care and better wellness practices for all. Thus, aligned with an earlier theory of Briton, education to me is a moral interrogation and a process of discovery of what should be. From as far back as the mid 1920 to 1930’s theorists such as Lindeman (1961, p.5) have continually argued adult education is “an endeavor that begins where vocational education leaves off with its purpose to put meaning into the whole of
life” (Briton, 1996: 4). Adults take on learning events with extensive life experiences and an historical episodic layering of information from which to grow. Accordingly, I believe educators in health care professions ought to assist learners to layer knowledge and develop skills, abilities and attitudes with requisite critical and creative thinking skill development.

Important to my argument is the assumption that foundational content learning must be established early in the program as surface or basic learning. However, later in the program, learning is deeper, less structured or less pre-packaged. Medical education reform has recognized the need for students to be able to function as medical practitioners when they leave medical school (Bradley, 2006) consequently thinking, questioning and revision is necessary of the MRI/fMR graduate.

For example, clinical practices are to be experienced only after teaching tools such as case study work, live and video demonstrations are experienced and human patient simulations are practiced with allowable mistakes early in the proposed MRI/fMR program. If the learning event calls for a more application-based (andragogy) over directional information-giving (pedagogy) philosophy and method then such need implementation. The content first, practice later principle of curriculum design and evaluation offered is supportive of a building of the knowledge, skills, abilities and attitudes necessary of the MRI/fMR graduate. Confidence in what is tried and later mastered is evident to the learner and facilitator. Note that this is not always a continuum but
often a concentric and cyclical manner of learning as needed and as required by the learner. As experience allows, new information can be reviewed and added.

MRI/fMR health care is, from one perspective, a much regimented procedurally based discipline that can be demonstrated and understood as being modeled by the actions and methodology of facilitators in the field. From another perspective, the career area demands an open minded approach and critical mind to discover new and better ways of employing the skills and technology in applied research opportunities. Particularly important to the new program proposal is to meet and exceed the competencies necessary of MRI/fMR specifications as set by external accrediting bodies. Second is to develop overall in the accomplished graduate a profile of knowledge, skills, abilities and attitudes that will shape humanistic, emancipatory and critical thinking and means to meet such challenges. The graduate of the program must go beyond mastering skills and abilities to reach advocacy and citizenship within MRI/fMR care for the good of all.

In summary, then, discoveries in learning evolve from discovered associations to the realization of applications necessary to health care practitioners. These androgogical, living learning events lead to inquiry and reason. The learner can select alternate paths, particular learning parts to form a learning ‘whole’ particular to their personal discovery and learning path. The next part of this paper will outline important aspects of “living learning” for the Mohawk-McMaster MRI/fMR
program: the use of new technologies; a learner matrix model; currency in a globalized world; self-directed learning; and self-evaluation.

**Characteristics of the Living Learning Model for the MRI/fMR program**

A variety of “living learning” experiences can enhance the MRI/fMR program at Mohawk-McMaster. Technology, in particular offers many opportunities for “living learning”. The use of PDAs and computer simulations renders just-in-time learning. Video conferencing, debates, case studies can be online and perhaps in real time events. Group discussions with other learners and experts online affords MRI students ample opportunity to question, to seek new connections and dismiss common truths to better solutions. Questioning the ‘what ifs’ and celebrating the ‘ahas’ perpetuate a learning environment and transformative realities. Debriefs of former solutions to previous challenges in real time and though online discussion allows for new possibilities for MRI health care.

Technological implications that Gehring (2000: 157-158) addresses in fact relate well to health education. First, the learning space itself should be adult-like and MRI/fMR work-related. This can be accomplished by employing simulated patients and demonstrations in life-like learning environments that mirror eventual clinical applications. Actual clinical demonstrations, human body simulators, imaging case studies, just-in-time PDA initiated web-based research, video
feeds, team discussion (virtual or face-to-face), historical case analysis of typical problems and informatics systems should be employed in the proposed MRI/fMR program to this end. PDA use as an educational technique, for example, can allow the learner to reference medical information and previous patient documentations in order to select a viable solution to a presented problem, as it develops. Case studies, patient simulations, clinical, historical analysis and debriefing through group discussion can be practiced in the MRI/fMR life-like learning events that allow self-directed adult learners to realize self efficacy and continually build on a set of knowledge, skills and abilities from this readiness to grow with appropriate attitude.

Today, patient simulators are used for a variety of purposes such as training, assessment and research; as well as for a variety of topics, such as …interpersonal skills (Bradley, 2006) while training diagnosis can be integrated with the ongoing demands of managing and stabilizing a changing medical or surgical condition (Murray et al., 2004). The resulting simulations cover a wide spectrum of sophistication, from reproductions of simple tasks on isolated body parts to performing complete tasks on high-fidelity human patient simulators replicating the whole patient and his variable physiological parameters (Bradley, 2006). Specific and managed MRI/fMR cases can be presented via human patient simulators that can address specific competencies of necessary, mandated curriculum while clinical situations mirror the uncertainties of floor management in health care.
A learner matrix model can also be used to supplement andragogy. The development of the learner in a matrix model, as suggested by Chovanic (1998: 309), culminates in meta-reflection based on a clear understanding of foundational knowledge, by asking creative questions and through critical thinking in a supportive environment and learning lab format. The methodology offers many ways and means to convey foundational content beyond a traditional lecture format for a learner to establish a base of knowledge. This groundwork forms the foundation that allows the learner to inquire, question and debate present theory and applied practical toward personal betterment and future MRI health care possibilities.

The health care professional responsible for operating the MR scanner, acquiring the study and caring for a patient during this examination is the Magnetic Resonance Imaging (MRI) Technologist or fMR Technologist. Self-diagnosis by the learner of MRI/fMR immersed in a learner-centric environment develops basic health care technical skill and leads to, understanding roles, behaviour and assessment skills necessary of the profession. Adult learners seem to seek the *why* and *what* to determine *how* and *when* the information can be applied with worth. This must begin with introductory and foundational learning to me. Specialized and integrated learning naturally develops from this base in andragogical learning. Evaluations of core content, application, practice and reflection occur in objective structured clinical exams. Further, single jump and double jump oral and written problem-based scenario and simulation assessments and
learning plans facilitate self-directed learning and the blending of individual questions based on previous learning, learning styles and learning situations. Critical decision-making is, therefore, inherent to the practice of magnetic resonance and is demonstrated in the competencies required of entry-to-practice technologists. Technologists are responsible for the safe and effective application of magnetic resonance; for the production, assessment, optimization and archiving of images; for the performance of diagnostic magnetic resonance procedures; and participates in interventional procedures critical to andragogical learning. The co-planning and process negotiation engages the learner and should only be guided by the facilitator who can act as a content resource as required. The learner buy-in and ongoing self assessment leads to greater commitment in mastering knowledge, skills, abilities and attitudes necessary of the graduate. Simulated learning and clinical practice must constitute the majority of learning in Levels Three and Four of the BScN MRI/fMR proposed program for application and naturalization. Living-learning also requires the involvement of students and health care providers who are up to date and aware of changes occurring in a globalized world. If the world’s health is to improve through more enhanced and effective health care, it must spring from well-educated health care providers’ intentional engagement with improved health care possibilities.

Briefly, the modern day concerns regarding health care, in my opinion, include technological demands and usage, pandemics, global germ warfare, and ageing populations. These unique health care demands and quality of life issues command new thinking and procedures beyond
current curriculum content expanses. A student of a health related educational program must learn to manage their learning in order to keep their knowledge current. Despite the confirmed need for vocational training and theory-based learning in preparatory, early stages of MRI/fMR health care education, there remains a need to set an attitude in the learner to ponder, question, and inquire toward improved health care possibilities for a more just society and community within which to offer health care. Learners should be encouraged to work with faculty in research studies and applications, involve themselves in the social, cultural and economic aspects of their community as volunteers and to consider one’s role as a health care provider amidst one’s lifesworld.

Fourthly, a living learning approach requires a commitment to self-directed learning (SDL). Merriam (2001: 8-10) requires students and faculty to understand the value of empowering learners to take increased responsibility for decisions related to learning as a humanist philosophy. In addition, students and faculty must encourage learners to engage in Self Directed Learning in order to work through difficult negative feelings and translate these experiences into high self-efficacy and skills necessary for lifelong self-directed learning, so as to assist the learner in becoming his/her own self-evaluator. This requires faculty to be well equipped in order to facilitate self-directed and student controlled learning (as a mode of living learning).

Finally, through the promotion of emancipatory self-directed learning and self action, the students would learn to advocate and act as change agents for their profession. MRI/fMR
practitioners must “learn to learn” and believe in themselves, their skills, and their abilities in order to seek answers to future challenges in health care settings. Health care requires advocates who continually seek changes, demanding better conditions in health and wellness for one’s community.

Thus, the new program specifically proposes to emphasize Directed Self-Learning (DSL) modules early on, that Merriam (2001) supports from Grow’s (1991, 1994) Staged Self-Directed Learning (SSDL) model suitable to a more guided approach in Clinical based reasoning. Later Self-Directed Learning (SDL) modules in final years are utilized, as self-efficacy grows. Merriam (2001: 9-10) references Grow’s matrix “whereby learners can locate themselves in terms of their readiness for and comfort with being self-directed, and instructors can match the learner’s stage with appropriate instructional strategies”. A more teacher-dependant pedagogical philosophy and goals are advantageous to facilitate early foundational learning, but later an andragogical philosophy is best as the program curricula relies on prior knowledge that the learner can better self-assess at this stage of their learning. The Health Education Assets Library (HEAL) resource provides health science educators who are freely available, high quality multimedia materials to augment interactive learning in the program, and lifelong health sciences education. The use of self-directed modular units of study such as the Tylerian behavioral model of education first employed at Mohawk College’s Health Science School in the early 1970’s is
recommended. (See Appendix 1). A hybrid model incorporating in-classroom Problem Based Learning sessions and online interactive simulations will encourage the learner to develop.

Finally, an androgogical, living learning approach requires that the learner becomes a self-evaluator. In the evaluation of the learning the teacher helps guide the learner to a practice of self-evaluation, as a support not a judge. The self-reflective process is used often in clinical practice and simulation exercises in health care education. In the proposed MRI /fMR program clinical experience facilitators will guide the student in self-assessment feedback skills in addition to peer and facilitator feedback support that augments the personal analysis. Faculty of the BScN program note that they support a 360 degree feedback system and that often learners perform tasks and offer dialogue within ‘comfortable’ areas of knowledge, skills and abilities. This aids in avoiding what others point to as necessary but overlooked, or as ‘uncomfortable’ areas of the learning. Thus, multiple approaches to developing an objective manner of self analysis including what is less natural or comfortable to the learner is encouraged.

A living learning model… a summary

I have argued that the model of living learning includes the use of new technologies; a learner matrix model; currency in a globalized world; self-directed learning; and self-evaluation. The concept of a life long learning-practice and deep understanding overrides the delivery of content
or surface learning. Content and health information needs to change with new technology, new discoveries and new theories of health care. Simply, the health care profession is rapidly advancing. Accordingly, the career of a MRI/fMR health care provider continually morphs. Central to this point is the fact that people are living longer, experiencing more disease and more unique combinations of diseases that must be diagnosed through MRI technology. Patients demand evidence-based paths to wellness as ageing offers no reason to slow down in life. Further, patients are better informed and often self diagnosed in comparing symptoms of common ailments in Web searches. As multiple diseases manifest in the ageing body, in new variables and symptoms, proof of root causes are found through this non-invasive popular MRI procedure. Diagnosis, however, is more difficult as previously unknown correlations surface and patients demand more sophisticated care and repair. The MRI/fMR professional of the future, I believe, will be required to critically think through the possibilities and information that is made increasingly available in a demanding global health care system.

The development of an intellectual scaffold through an “infrastructure of information to which new material can be anchored” (Ausubel, 1960) legitimizes implicit knowledge in students (Browns, Collins & Duguid, 1989: 38) and recognizes that motivation is the basis of the learning through the process of Problem Based Learning to Keppell et al (Keppell, Elliott & Harris, 1998: 420). Thus, the learning must increasingly deepen and be both active and integrated in MRI/fMR curriculum and methodology of the proposed program. Adult learners are best suited
to this philosophy and methodology due to their prior knowledge, a mature commitment to
learning and life experiences that can be related to new incoming information. The adult learner,
in my experience, thrives in the social situations and discussions typical of MRI/fMR Clinical
learning both shared and team-applied. Adult learners again seem to seek the why and what to
determine how and when the information can be applied with worth. Thus, computer simulations,
data and informatics of research are easily accessed through Web enabled technology at typical
health care sites that challenges established practices and commonly held conclusions. New uses
for diagnostics enabled by MR technologies and techniques combined and sequenced in practice
coaalesce to new application and discovery.

**Necessary processes for facilitators of a living learning model**

For the learner, the living learning model involves: the use of new technologies; a learner matrix
model; currency in a globalized world; self-directed learning; and self-evaluation. The adult
educator or the facilitator of this model should consider: offering various forms of feedback;
assuming different roles as an instructor; and utilizing the principles of change management.

Debriefing opportunities, continual and varied source feedback opportunities, self and peer
assessment strategy, team discussions and facilitator advice may all be beneficial in a living
learning model. The learner must be self directed to ponder, to wonder, to inquire, to question
existing schematic systems in order to transform the field and lead in as emancipators with an
attitude for betterment toward a more just society. The proposed program is charged with
ensuring error free and meticulous care in MRI/fMR procedure of our graduates, no doubt.
However, feedback should encourage the program graduates to go beyond learning procedures,
to transform the health care of patients who could benefit from MRI/fMR technology and skills.
More self-assessment, peer assessment and problem based self directed learning occurs as
Clinical experience opportunities increase in each level of the BScN MRI/fMR program
structure. Throughout, autonomy, responsibility and confidence develop of the learner. As new
learning situations present themselves in health care MRI/fMR careers the learning transfers and
presents more naturally from living lab experiences as a student. Varied feedback promotes a
change in the learner that is the very magic of education. The ahas are the new connections, and
the restructuring of what is to what can be, the new knowledge in my mind.

Further, careful consideration of the particular teaching tool selected and the training
environment match with specific competency and learning outcomes is paramount to building the
learning required in sequential staging in learning. The availability and variety of the learning tools
available to the MRI/fMR program co-relate to the breadth and depth of learning possible for its
graduates. In particular, as part of simulation “The instructor” Schmidt (2006) “can assume
different roles in training, depending on the training objectives and the chosen instructional
strategy including the theoretical approach to learning and the employed training methods”. This
may mean that faculty must learn and hone new instructional skills and techniques so as to ensure that the simulations are specific to the MRI/fMR simulation setting.

Finally, I believe adult education is meant to be transformative perhaps quite like change management in organizational behaviour. In change management one is guided by change managers often seen as transformational leaders. In education, transformative agents or facilitators of learning I think assume the same sort of role. When one considers why individuals are resistant to change, one considers barriers such as saving face, the direct costs to the individual of the change, the fear of the unknown, breaks with routine, incongruent systems such as control and operational systems evidenced in group resistance or incongruent behaviours (McShane, 2006: 470-2). Refreezing in change management occurs when the organization’s systems and structures are aligned with the desired behaviours (McShane, 2006: 471). Unfreezing of undesirable behaviours occurs when the driving forces are stronger than the restraining forces. Corporate leaders’ buffer employees’ knowledge of both internal information and external environment data as teachers restrict content in prescribed lesson planning. Neither situation fosters growth or new knowledge followed by a new task orientation.

Just as exposure to external forces such as competitive pressures and product innovations force change in organizations, exposure and experimenting with new knowledge through Problem Based Learning (PBL), Clinical and Self Directed Learning (SDL) leads to new knowledge
schemas evident and demonstrated in enhanced skills and abilities of the learner. Reducing the 
restraining forces encourages change in corporations that can be likened to reducing child-like 
inhibitive behaviours in learning in favour of more sophisticated critical analysis and evaluations 
in adult, career-related modes of learning. The learning moves through the change and is 
experienced and felt through as real and applicable.

Methods of dealing with resistance to change in organizations include communication, 
determined learning events, employee involvement, stress management, negotiation and coercion 
(McShane, 2006: 471). I purport that facilitating learning within an andragogical methodology is 
co-relational. The facilitator of learning toward transformation encourages the discovery of new 
knowledge, learning tasks and personal development through similar methods in experiential 
learning situations integrated in PBL and Clinical sessions. Learning occurs in the PBL, SDL and 
Clinical settings in an obvious and transparent manner affording the learner the opportunity to 
actualize the learning and its application from self-efficacy. In both scenarios active learning is 
the key. Competences that require practices in accordance with legislation, regulatory and 
professional bodies’ standards of practice performed in a manner consistent with public interest, 
employment philosophies and practices, current research and advancing technology are honed. 
Students seek guidance from experienced practitioners to enhance the technologist’s individual 
experience and knowledge in light of a career that requires one to promote and participate in the 
advancement of the dynamic profession through active involvement, continuous learning,
professional development and research.

Negotiation amongst group members with possible discussion with the leader results in less resistance to accepting new information organized and associated to more comfortable prior learning, seen less a risk. Coerced or forced change in learning is less effective and seldom transformative. In corporations, coercion forces one to finally adapt or leave the organization while in learning it means compliance to the remembering of content without conviction. Neither is transformative nor engaging. Finally, refreezing new behaviours by realigning organizational systems, such as company rewards, system alignment and feedback McShane (2006: 472) assures the refreezing that is necessary for adoption of the new. Such are formative and summative assessments, honours standings, graduations and credentials in the educational environment.

In education, I believe that experiencing, practicing and applying new knowledge assures new learning that affects behavior. The facilitator of the learning encourages self and peer assessment in group activities, in 360 degree feedback mechanisms and self-evaluation techniques. The assessment then transparently aligns the employee or learner with efficient new learning methodology for new and connected discovery. As such, the change agent and the ‘teacher’ are transformational leaders championing emancipatory change and new connections.
Reflective learning is important to health care education as it assists the student to learn for the long term in associating what is new to previous knowledge. It is important to realize as teachers and learners what is important to know in the future or in one’s career, especially when today’s content or information will only be relative given constant revision, update and research. As the medical field is ever-changing, a reflective approach to learning is essential to condition the learner to be ever-vigilant in the quest for new knowledge with its appropriate integration into one’s MRI/fMR life work. Thus, any methodology that has the learner reflect critically with information and data is beneficial to lifelong learning and most suitable in an andragogical approach with adult learners in mastering content. The development of critical reflection skills then must be encouraged.

The best methodological and philosophical practices for the delivery of the MRI/fMR program align with Moon’s “set of abilities and skills, to indicate the taking of a critical stance, an orientation to problem solving or state of mind” (1999: 63). Moon’s definition of reflective practice supports my philosophy that learning is a state of mind more than a collection of content. Methodology toward reflective practices such as journaling, scrap-booking, poster or
headline objects, case studies, discussion groups, learning portfolios, mentor/learner feedback sessions, group reflections and discussions as well as online blogs, collections of associated links and learning community discussion groups, assist the MRI/fMR health care learner in thinking through new content more broadly and deeply. The experience with learning manifests in better graduate knowledge, skills, abilities and attitudes that operate on the job.

Reflective andragogically based learning in living learning lab environments is important to MRI/fMR health care education as it assists the student to learn for the long term in associating what is presented as new information to previous knowledge. Teachers and learners may ponder what is important regarding the future and its effect on one’s career, especially as today’s content or information is only relative given constant updates and research in a living learning experience. As the MRI/fMR medical field is ever-changing, a reflective approach to learning is essential to condition the learner to be ever-vigilant in the quest for new knowledge with its appropriate integration into one’s life work. Only then will we be capable of celebrating the “ahas”. Only then will the learning realize significance to a relationship with one’s values and previous learning and consequently engage the learner in a challenging, experiential and relevant manner, andragogically based. Only then will one believe it to be the best methodological and philosophical practices for the delivery of the Medical Radiation Sciences-MRI/fMR program.
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Appendix 1

The Context of the Mohawk College and the McMaster-Mohawk-Conestoga Partnership

A History

As reported for accreditation submitted to CASN, Board of Accreditation, March 2006, by the McMaster-Mohawk-Conestoga Collaborative BScN Program, Educational Unit, Part C: Mohawk College Site Document, the educational unit of Mohawk College reports support of the McMaster-Mohawk-Conestoga BScN Program, its implementation and the achievement of its learning outcomes. The history included in this context section of the paper is directly referenced, mostly verbatim, from the above-mentioned report.

Throughout this Mohawk cite specific and authored document, the exceptional collective values, attitudes and practices of Mohawk College, as a whole, are evident in the BScN program goals, intent and learning strategies. In 1999, the government of Ontario announced that the BScN degree would be the entry to practice credential for Registered Nurses in Ontario. In order for a graduate to write the Canadian Registered Nurse Examination, the College of Nurses of Ontario required that as of January 2005, all graduates must possess a BScN degree in nursing from an approved university program. In addition, the Ontario Ministry of Training, Colleges and Universities stipulated that college Diploma Nursing programs needed to partner with a university in order to provide this new level of education. The decision to partner with McMaster University seemed a natural one as Mohawk College had a long history of collaboration with McMaster University and the location of The Institute for Applied Health Sciences (IAHS) campus of Mohawk College is on the McMaster University grounds. Prior to collaboration, the McMaster BScN Program and the Mohawk College Diploma Nursing program had congruent philosophies and values related to learning.
Mohawk College serves the communities of Hamilton, Brantford and Southwestern Ontario with a current enrollment of 10,000 post secondary students and 40,000 continuing education students. Since 1973, Mohawk College has trained more than 10,000 nursing graduates in Hamilton and Brantford. Mohawk College is the largest in-school apprenticeship trainer in the province of Ontario, with more than 3,000 people registered in skilled trades programs (Media Release, May 11, 2006). Mohawk College continues to be a full service educational institution; responsive to the educational needs of the community it serves, offering a wide range of programs leading to three and two-year diploma programs, one-year college certificates and graduate certificates, collaborative degrees and degree completion options achieved through articulation agreements with other educational institutions.

Prior to the implementation of the McMaster-Mohawk-Conestoga Collaborative BScN Program, a decision was reached by the three partner schools to use the existing accredited McMaster University Undergraduate Nursing Program Curriculum with the understanding that the partners would work together to renew the curriculum collaboratively over the ensuing years. Process based curriculum has since been adapted resulting from the work of a joint committee from the three partner schools, called the Collaborative Baccalaureate Curriculum Coordinating Committee (CBC3), and included: the revision and updating of the Program mission, philosophy, model of nursing, model of nursing education and the terminal goals of the BScN Program. Curriculum renewal work through the Curriculum Innovation Committee (CIC) is ongoing with faculty and student membership from each site. Course implementation at all four levels of the program are integrated with both Mohawk and McMaster sharing responsibility in a 47/53% split respectively. Courses are offered at both campus locations dependent on implementation responsibilities. Mohawk and McMaster share responsibilities and adaptations necessary for student recruitment, admission requirements, program adaptations, to the accredited curriculum, methodological adaptations and learning resource support.

1962 was the first year of a new two-year (22 academic months) School of Nursing Program as granted by the Government of Ontario from traditional three-year models. The resulting Hamilton and District School of Nursing was established based on a different educational concept and not officially attached to a single hospital as students study clinically in a variety of co-operating hospitals. Mohawk College, though involved in health sciences educations since 1971, began its first collaborative nursing program in 1973 originally based on the Tylerian behavioral model of education and adult education principles. A
self-directed philosophy based on specific learning objectives was employed to frame Sister Calista Roy’s Theory of Nursing curriculum with complimentary compulsory clinical practice. In 1982, an additional semester of clinical practice was added as advised by the Ministry of Education. In 1979, four area hospital campuses were consolidated into the Chedoke Campus in Hamilton. In 1996, faculty revised curriculum by retaining the self-directed and small group methodology but the model and philosophy of education reflected a move away from mastery learning and behavioral objectives towards one that was based on a model of the “caring curriculum”. From this a detailed mission statement, philosophy, goals, and curriculum blueprint of a new Diploma Nursing program was established. As McMaster and Mohawk College share beliefs about self-directed learning and problem-based learning as preferred learning methods, the learner centered small group methodology fit was natural. It is the belief of curriculum designers or faculty of the two institutions that such methodology produces graduates with improved critical thinking skills as well as strengths in leadership, interpersonal skills, and effective group dynamics team building skills. The demonstration of evidenced-based practice is required from first Level in the Program in small group discussions and in scholarly papers that are required as part of the evaluation criteria for courses, and in clinical assignment evaluations. The Collaborative Program uses standardized patients as part of the format for simulating and evaluating student learning in “problem-based” learning scenarios. Students utilize the standardized patients to develop expertise in physical assessment, communication and interview skills. It is from this BScN program that a fourth stream in MRI/fMR is proposed.

**The BScN, Proposed MRI/fMR Program Description**

Further as submitted to CASN, Board of Accreditation, March 2006, by the McMaster-Mohawk-Conestoga Collaborative BScN Program, Educational Unit, Part C: Mohawk College Site Document, the educational unit of Mohawk College reports the following. The four-year degree/diploma program prepares the learner for a career in Medical Radiation Sciences, accredited with the Canadian Association of Medical Radiation Technologists, with a proposed Level 2 specialty in Magnetic Resonance Imaging, Functional MR. The program qualifies students to work in one of four specialist professions within the area of clinical medical technologies. The other three Level 2 specializations presently offered are Radiography, Ultrasonography and Radiation Therapy. Graduates will become part of the provinces Local Health Integration Networks (LHIN) team of people and technology, virtually connected in a network
best suited to place and time reductions through information and skills sharing. The ConJoint Committee, of Medical Radiation Technologists, Competency Profile, CAMRT monitor the training offered in the program to prescribed competencies and assessments across the province.

The fast-paced industry demands the use of new technologies to promote innovation and productivity in the health care industry. The broad skill set allows graduates to be more involved in interdisciplinary activities and applied clinical research in the workplace. The program increases the potential for innovation while ensuring the optimal use of diagnostic imaging resources in both the health sector and other related sectors of the economy. The field offers the best diagnostic test in relation to soft tissue to assess the body for the determination of the presence of disease as it is non-invasive and does not subject the body to ionizing radiation. Further Nuclear Magnetic Resonance can provide additional information related to tissue/cell physiology and function by Functional MR. The program specialty will afford the learner studies in MR anatomy/pathology and imaging protocol; professional practices, quality assurance; patient and client care; MR system hardware; safety of MRI; contrast media for neuron-radiological applications; physical principles and image quality; and effects of artifact faults.

Career opportunities exist as a Technician, Technologist and Health Support Officer within the field of Magnetic Resonance Imaging, Functional Magnetic Resonance through Nuclear Magnetic Resonance in imaging department of hospitals, clinics and medical or chiropractic offices. Research opportunities in the workplace can be sought. Sales and service positions related to the industry are also available.

Proposed Delivery Model and Credential

Further as submitted to CASN, Board of Accreditation, March 2006, by the McMaster-Mohawk-Conestoga Collaborative BScN Program, Educational Unit, Part C: Mohawk College Site Document, the educational unit of Mohawk College reports the following. The Medical Radiation Sciences degree/diploma program is presently offered in a McMaster University and Mohawk College partnership. The first year of the program clusters with the other aforementioned Level 2 specialties. Core curriculum, although constantly revised and updated, will remain common.

The competencies for the MR specialty are very clear and well documented. The program will ensure that learning opportunities develop the knowledge, skills, abilities and attitude of graduates necessary to meet or exceed all competencies set by the of Medical Radiation Technologists, Competency Profile, CAMRT.
for a degree program through course learning outcomes. The work of the Steering Committee and associated curriculum design team composed of subject matter experts will ‘containerize’ all competencies within course offerings from the overall competency ‘shell’. Mohawk College and McMaster University will assume responsibility for particular individual courses as will be determined by the Steering Committee.

The Ontario College Diploma from Mohawk College is offered concurrently with a Bachelor of Science degree granted by McMaster University in Medical Radiation Sciences (MedRadSci) (Procter, 2007:17-20) The program specialty proposed will afford the learner studies in MR anatomy/pathology and imaging protocol; professional practices, quality assurance; patient and client care; MR system hardware; safety of MRI; contrast media for neuron-radiological applications; physical principles and image quality; and effects of artifact faults. The educational process then must mirror the environment within which the health care provider will operate and make decisions. Knowledge, professional and personal attitude and values, skills and abilities must develop from the proposed program’s curriculum, projects, activities and evaluation.
Appendix 2

Undergraduate Calendar, McMaster University, Hamilton Ontario 2006

Graduates of BA, Med Rad Sci will:

Provide nursing care reflective of primary health care principles.
Demonstrate sensitivity to client diversity and recognize the influence this has on professional and personal meaning, client’s health and healing practices and access to health care.
Demonstrate ability to establish, maintain and terminate therapeutic relationships with clients.
Demonstrate critical thinking in the assessment, planning, and evaluation of client care through the synthesis and application of
- Validated knowledge and theories from nursing, the humanities, biological, psychological, social, and public health services
- Knowledge of the health care system
- Knowledge of the client context
- Knowledge of self.

Engage in effective decision-making to set goals and establish priorities, going beyond the application of general rules to the application of unique combinations of principles and concepts.
Provide safe, ethical, competent care within established professional standards and guidelines.
Assess, plan, and evaluate programs of care with clients and an inter-professional health care team and with partners from multiple sectors (i.e. education, social services, policies, etc.).
Demonstrate leadership and beginning competencies in managing a health care team, managing resources, and coordinating health care.
Access and manage relevant information, required for professional caring, through the effective use of information technology.
Contribute to the body of nursing knowledge through demonstrating an inquiring approach to practice, identifying research findings, participating in research activities,
and sharing research results with others.
Identify the need for appropriate change, create a climate for adapting to change in self and others, and contribute to effecting and evaluating change.
Participate in developing and implementing strategies for advocacy and political and social action on behalf of and with clients, and the nursing profession.
Recognize, develop, and maintain the personal characteristics associated with professionalism:
- Awareness of competencies and limitations
- Accountability for action
- Commitment to the search for new knowledge
- Advocacy for the voice of professional nursing
- Commitment to self-directed, lifelong learning, critical self-reflection and reflective practice