

COMMENTARY

Creating a virtual “global community of learners” in radiation medicine through sound educational principles[†]

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ABSTRACT

The International Atomic Energy Agency (IAEA), comprising ¹⁵⁴ Member States, is an internationally recognised repository of knowledge in the radiation medicine domain (nuclear medicine, diagnostic radiology, radiation oncology, and medical radiation physics), as delivered through its Department of Nuclear Sciences and Applications-Division of Human Health (NAHU). This paper discusses the goal and implementation strategy adopted by NAHU towards realising its educational vision, namely, to create a virtual global community of learners for radiation medicine professionals in IAEA’s Member States. The virtual community refers to a distance learning platform and resource made available to the IAEA’s Member States. Since ²⁰⁰⁸, NAHU has been explicitly integrating sound educational principles into the Division’s education and training programmes to accomplish this educational vision.

To translate the above educational vision into action, content, process, and information technology experts at NAHU have been involved in a collective effort to progressively focus on developing strategies for “reflective practice” by employing educational processes based on a continuous quality improvement philosophy: Plan-Do-Check-Act. This paper describes an ongoing effort in this direction, which entails several developmental stages utilising a set of awareness-raising and internally planned capacity building activities.

NAHU functions as a “learning organisation” that encourages a collaborative learning environment. NAHU also emphasises the development of reflective practice, critical thinking, and knowledge building through a virtual learning environment. By incorporating the practices of a learning organisation, this transformative strategy can prepare NAHU’s professional staff to build capacity in radiation medicine across the globe with the aim of minimising the gap in radiation medicine between the developed and developing countries.

INTRODUCTION

This is a case study about professional education programmes that are conducted by an international organisation at a global scale, based on the application of sound educational principles to enhance their effectiveness. The International Atomic Energy Agency (IAEA), which was set up as the world’s “Atoms for Peace”

organisation in ¹⁹⁵⁷ within the United Nations family (Eisenhower, ¹⁹⁵³), is the world's centre of cooperation in the nuclear field. The IAEA serves its ¹⁵⁴ Member States by promoting safe, secure and peaceful nuclear technologies. Its key role is to contribute to international peace and security and to the World's Millennium Goals for social, economic and environmental development (Vienna International Center/IAEA, n.d.).

Through Science and Technology, the IAEA assists Member States to mobilise the peaceful uses and applications of nuclear science and technology. The work contributes to the goals of sustainable development in fields of energy, environment, water, health, and agriculture. The IAEA is widely known as the United Nations' nuclear watchdog, but a less known role of the Agency is a focus on education and training activities for the Member States. The IAEA acknowledges that education and training is "crucial for effective and sustainable technology transfer to developing Member States" (International Atomic Energy Agency, ²⁰⁰³, p.5).

While recognising that the IAEA is a non-academic setting, the Division of Human Health (NAHU) aims to achieve its objective of enhancing the capabilities in Member States to address needs related to the prevention, diagnosis and treatment of health problems through the application of nuclear techniques. The mandate arises from Article II of the IAEA's Statute: the Agency shall accelerate and enlarge the contribution of atomic energy to health. This subscribes to the overall mission of IAEA and affirms that education and training is fundamental for effective and sustainable technology transfer. Education and training is usually provided through: (1) training courses and conferences designed to create awareness and impart knowledge among scientists and professionals, (2) short-term fellowships to provide scientists and technologists with practical experience, (3) university undergraduate training to impart knowledge early in the careers of students, and (4) higher degree training, including doctoral training (International Atomic Energy Agency, ²⁰⁰³). The main contextual challenges in radiation medicine are the rapidity of the pace of technological developments and their applications in the field of medical imaging, radiation oncology, and medical radiation physics. Driven by advances in knowledge-based technologies, the rapid technological development in radiation medicine has created a professional context in which members of multi-disciplinary teams must operate in an ever changing world as partners in the integrated care of patients.

NAHU'S EDUCATION AND TRAINING ACTIVITIES

NAHU's education and training activities typically serve three goals: knowledge mobilisation, technical skills development and educational skills. Examples of NAHU's education and training activities include regional training courses, fellowships, scientific visits, research coordinated programmes, and training the trainers. In the case of training the trainers, for example, NAHU provides specific educational skills development as requested by the Member States so that the learners can become effective instructors and facilitators in their local communities and regions.

NAHU's professional staff members develop and implement materials for education and training activities to respond to the needs of learners in the Member States. Principles of quality assurance in education help to enrich the way these needs are met. For example, the professional staff members continuously integrate concepts of curriculum mapping (Jacobs, 1997) to design and implement education and training activities by ensuring that learning objectives are measurable and are consistent with assessment and evaluation purposes.

CAPACITY BUILDING AT NAHU: BRIDGING THE KNOWLEDGE GAP

Rickett (2000) compares a competent organisation to a tree with a good root system and challenges each organisation to emphasise approaches to growing healthy roots. NAHU needs a solid foundation to achieve its objectives, and all stakeholders must be engaged in the learning process. Capacity building primarily aims to “enhance the ability to evaluate and address the crucial questions related to policy choices and modes of implementation among development options, based on an understanding of environment potentials and limits and of needs perceived by the people of the country concerned” (United Nations Conference on Environment and Development, 1992). This involves human resource development and strengthening of managerial systems. The need to incorporate capacity building events is addressed within NAHU as a way to develop education and training resources with an explicit focus on the needs of the Member States. For example, NAHU conducts bi-monthly capacity building sessions to discuss good practices, educational innovation, and the use of technology in education and training activities with a view to bridge the knowledge gap within the Division. Through this educational approach, NAHU supports its educational vision of creating a virtual global community of learners in radiation medicine by offering an opportunity for its the professional staff members who are experts in their scientific contents to continuously and collectively advance different educational skills for, as an example, developing education and training resources. Rickett (2000) emphasises the need for capacity building to address the institutional vision by providing a corresponding strategic plan to achieve the vision. Since NAHU sees itself as a source of knowledge in radiation medicine to its developing Member States, it must equip itself with educational principles to mobilise the knowledge it has acquired through research activities by its in-house content experts. This practice is consistent with the definition provided by the United Nations Development Program (1997) for viewing capacity building as a long-term, ongoing process that requires a holistic approach to participation from all stakeholders. In addition to building capacity, NAHU also integrates practices of learning organisations using educational principles into its process of developing education and training resources to support the educational vision of creating a virtual global community of learners.

To build capacity in a sustainable manner across the Member States, engaging all stakeholders into the learning process is fundamental. Senge et al. (1994) identified the importance of including all stakeholders into the educational process in the belief

that “[A]t its essence, every organisation is a product of how its members think and interact” (p.48). NAHU embraces this view into its process of developing education and training activities for the virtual global community of learners.

INCORPORATING “LEARNING ORGANISATION” PRACTICES INTO NAHU

Emerging issues of teaching and learning necessitate the incorporation of “learning organisation” (Pedler, Burgogyne, & Boydell, 1997; Senge, 1990; Thomas & Allen, 2006) practices into the work of NAHU (Chhem et al., 2010) while creating opportunities for experiential and life-long learning. NAHU is a scientific division that “creates environments and experiences that bring students to discover and construct knowledge for themselves instead of one that merely transfers knowledge from faculty to student” (Barr & Tagg, 1995, p.15). Furthermore, these issues position the staff members in the active learning cycle by enabling them to garner new information through thinking, analysing, and planning all the way to involvement in the activity, and participation and engagement with the research and learning experience (Kolb, 1976; Kolb & Fry, 1975; Smith, 2001). By effectively discerning current teaching and learning needs and using a learning-centred approach (O’Neil & McMahon, 2010), NAHU is able to improve the knowledge and skills of practitioners within the Member States. Through internal capacity building events as mentioned above, NAHU incorporates “learning organisation” practices into its education and training activities for its Member States.

In a changing context reflecting its transformation from a “training” organisation to a “learning” organisation, NAHU encourages its professional staff members to continue their learning and improve their existing educational skills to add value to the process of creating a virtual global community of learners. With this intent, the professional staff members view themselves as the ones who are willing to regenerate new learning content to fit emerging learning needs of the Member States. For example, the professional staff members become more mindful of including reflective practice and critical thinking case studies into education and learning resources for the Member States through the virtual global community of learners. The changing context aligns well with the educational mission of NAHU and allows the professional staff members to keep an “outcomes based curriculum” and development of competencies at the forefront of all discussions, planning, learning activities, and assessment processes.

In incorporating learning organisation practices, NAHU’s professional staff members construct education and training activities for the virtual global community of learners using four criteria: increased learning skills and capacities, transformed organisational culture and structure, involvement of the entire work plan chain in the learning process, and enhanced capability to manage knowledge (Marquardt, 2011). The professional staff members mobilise their knowledge and experience at NAHU to embed these four criteria into the learning resources made available to the virtual community.

EDUCATIONAL QUALITY ASSURANCE FOR ADULT LEARNERS (EQUAAL)

In the pursuit of excellence in creating a virtual global community of learners in radiation medicine education and training programmes for the Member States, NAHU has established the Educational Quality Assurance for Adult Learners (EQUAAL) (Ros, Pascual, Chhem, & Dondi, ²⁰¹²) by adapting it from the Ros Gravitational Theory (Ros, ²⁰¹⁰) to suit the human health curricular requirements. This theory emphasises the dual interaction dynamics among relevant stakeholders who must share a common goal of creating quality education and training programmes. The dual interaction dynamics involve willingness to integrate and implement quality assurance principles and strategies as agreed upon by a specific group of stakeholders. In the case of NAHU, the professional staff members openly discuss and agree to include sound educational principles to enhance their education and training activities for the Member States. The sound educational principles as integrated into the work of NAHU's education and training activities include adult education (i.e. andragogy and transformative learning), health professional continuing education, multicultural education, quality assurance in education, and technology-assisted learning principles. These principles strengthen the virtual global community of learners by conceptually assisting NAHU's professional staff members during the process of developing curricula for the education and training programmes. Next, we address each educational principle respectively.

Adult Education

NAHU produces educational and training materials for adult learners in the virtual global community of learners. Therefore, it is essential for NAHU's professional staff members to apply principles of adult education such as andragogy and transformative learning into their curriculum development processes. At every stage, from curriculum development to assessment and evaluation, NAHU integrates the concepts of andragogy and transformative learning which complement each other and together explain how adults think and how they should be taught in this globalisation era. By being informed about how adults learn and what motivate them, NAHU's professional staff members design education and training activities that specifically focus on the learners' needs within radiation medicine contexts.

Andragogy: Andragogy encourages NAHU's professional staff members to view radiation medicine specialists as adult learners who, for example, need interactive problem-based learning resources. For strengthening the virtual global community of learners, NAHU includes learning resources that are consistent with such principles of andragogy. The notion of andragogy asserts that adult learners become self-directed and more mentally and financially independent as they grow older. Adult learners carry with them life experiences that affect their learning, are ready to learn, are more problem-based than subject-based in learning, and are motivated to learn and are responsive to different motivational factors such as better job or greater

self-confidence (Knowles, ¹⁹⁶⁸). Andragogy allows adult learners to have their own goals and purposes of learning. Andragogy also encourages contemporary adult educational institutions and curriculum planners to focus on creating educational experiences that are developmental and individualised, experiential, life-oriented, and relevant to individual learners. Moreover, the institutions also move the learners towards self-directing learning process while their life experiences are valued and included in the curriculum; adult educators need to offer opportunities for learners to become active participants (Knowles, Holton, & Swanson, ¹⁹⁹⁸). The most effective learning occurred when the learners (1) took responsibility for their learning, (2) were cooperative, collaborative, and supportive, (3) were accountable for their new learning, and (4) were empowered by the student-centred approach. Adult learners need to have room to develop their critical thinking ability, develop a social support system for learning, and develop life-long learning skills.

Transformative Learning: Transformative learning focuses on the cognitive process of learning. The fundamental principle underlying this approach is the mental construction of experience, inner meaning, and reflection (Merriam, Caffarella, & Baumgartner, ²⁰⁰⁷). In applying this principle to the virtual global community of learners proposed here, NAHU believes that transformative learning begins when the individual is aware of a gap in his/her knowledge base or a topic in question and consequently begins the learning process. Baumgartner (²⁰⁰¹) emphasises the significance of the participation of the adult learners in their learning process on the premise that “[K]nowledge is not ‘out there’ to be discovered but is created from interpretations and reinterpretations in light of new experiences” (p. ¹⁶). Life experience of the learners is the source for development and change and only learners can make those changes.

Health Professional Continuing Education

In further building a virtual global community of learners, NAHU also adds in concepts of health professional continuing education into its curriculum development processes and staff capacity building events. The literature on Health Professional Continuing Education informs NAHU’s professional staff members’ thinking as it relates to adult learning. Schön (¹⁹⁸³, ¹⁹⁸⁷) has written about reflection in practice/reflection on practice. It is essential that learning activities for health professionals are grounded in practice, with evident application in the workplace. Wherever possible, the previous knowledge base of participants needs to be honoured and respected, so that new learning can be accommodated into what is already known. From the continuing medical education literature, we know that lecture-based courses have a poor record in terms of changing practice. Techniques such as case-based learning are useful in achieving mastery of information and practicing application to problems that are similar to those encountered by the health professional in their local community or region (Straus et al., ²⁰⁰⁴; Oxman et al., ¹⁹⁹⁵). Health professional continuing education is consistent with the notion of andragogy as they both have relevance to adult learning processes.

Multicultural Education

Principles of multicultural education need to also be integrated into NAHU's education and training programmes, particularly in teaching adult learners from diverse contexts. During the process of developing learning resources, NAHU ensures that multicultural education principles are included. Multicultural education can be defined as the willingness, desire, appreciation, and effort to accept, value, and promote all possible cultures in classrooms. According to Davidman and Davidman (1997) and other researchers and scholars of multicultural education, multicultural education is defined as an umbrella term for educational policies, curricula and programmes that respect and embrace democracy, educational equity, empowerment of students and their parents, cultural pluralism, intercultural/interethnic/intergroup understanding and harmony, extended funds of multiethnic knowledge, and a multicultural perspective. Pang (2004) further explains that multicultural education's caring-centred approach can be achieved upon reinforcing a trusting relationship and understanding the sociocultural context of all learners and cultures. Language is an important consideration in this process of developing intercultural understanding.

Quality Assurance in Education

To constantly improve the virtual global community of learners, NAHU believes that principles of quality assurance (QA) in education need to be a part of its continuous quality improvement (Deming, 1988) work plan. NAHU includes these principles into the curriculum development processes and staff capacity building events. Crosby (1979) defined quality as fulfillment of client needs. This, when translated into educational parlance, may be compared to the learner-driven method (McIlroy & Walker, 1993). A principal insight in current educational methods employed to assure quality is putting the learners into the centre stage (Robinson, 1994) and planning curricula and procedures that most completely meet the learners' needs. In more general terms, QA requires definition of standards and implies measurement of achievement of those standards, with a feedback loop to ensure that future actions are modified based on the information.

TECHNOLOGY-ASSISTED LEARNING PRINCIPLES

NAHU aims to create an interactive and effective virtual global community of learners for the Member States. To achieve this goal, NAHU is in the process of examining current technological advances and new developments in educational sciences. NAHU believes that all teaching and learning processes require a complete analysis of how to maximise potentials of the internet in relation to ethical, institutional, technological, and pedagogical concerns. NAHU can also bring its virtual community to the next level by adopting adequate methodologies for a virtual education.

Human Health Campus (International Atomic Energy Agency, 2011a), a resource website created by NAHU as a virtual campus for the Member States to access

relevant educational and training materials in Radiation Medicine, is acknowledged as an important first step in this direction, which could be pushed further by the creation of structured online courses. During the annual General Conference at the International Atomic Energy Agency, the mobile phone version of the Human Health Campus was launched to maximise the learning experience and accessibility of learners in different Member States. This event sets a precedence for future real-time Mobile Learning (M-Learning) capabilities (International Atomic Energy Agency, ^{2011b}).

SUMMARY

The paper presents NAHU's educational vision of becoming a virtual "global community of learners" in radiation medicine by incorporating the practices of a learning organisation. In addition to promoting a collaborative learning environment for the Member States, NAHU also incorporates the role of virtual learning while valuing reflective practice, critical thinking, and knowledge building through a virtual learning environment. NAHU's professional staff members continuously build capacity in radiation medicine across the globe as a means of minimising the gap in radiation medicine between the developed and developing countries through sound educational principles. The paper describes how this fundamental goal of creating a virtual global community of learners can be achieved by including certain well-established educational principles into the curriculum development processes and staff capacity building events.

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