

Competency-based Training of Radiotherapy Technicians in a Simulated Environment.

Principles, Experiences and Critiques.

Is Knowledge a Skill?

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Introduction

The training of radiotherapy technicians is of vital importance for a department of radiation oncology. More than one third of the staff is employed in this profession. Recruitment, training and retention of staff are closely related human resource instruments that impact on the department's quantitative and qualitative performance. Training is probably the most dominant instrument for implementing therapy to the highest standards. This paper addresses issues that are related to the development of competency-based training programmes and the successful transfer of training results to the workplace.

Problem

The complexity of the therapies in the domain of radiation oncology is constantly increasing. The innovations in 3-dimensional conformal therapy and the recent installation of the 2 Varian 2300 linear accelerators are some of the developments that underline the need for professional expertise of radiotherapy technicians. These technological advancements do not only affect the technical competencies of the staff, but also their responsibilities, and attitudes.

It goes without saying that training plays an extremely important role in this field. However, researchers in the field of training and development estimate that only 10% of the formal classroom training programmes have a specific impact on the performance of employees in the day to day work environment (Broad & Newstrom, 1992; Latham & Crandall, 1991). These figures indicate that new approaches towards training and development are required. Traditional classroom training is not appropriate for the development of complex competencies in a high tech environment. On-the-job training is partially effective as far as the risks for patients, trainees and equipment can be controlled, and as long as the work environment permits preparatory work, a slower pace and constructive feedback. Many workplaces can not fulfil these conditions.

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The skills lab is a very attractive alternative, if not the only way to train radiotherapy technicians for their professional work in the preparation and therapy units. The skills lab is a safe, but costly, learning environment where trainees can complete a curriculum that meets the job requirements and new educational standards. The skills lab simulates the work environment, whereas the regular disruptions by priorities of the hectic work in the units are absent.

Moreover, two major problems are still not resolved:

- ▼ The transfer of the acquired skills from the training to the workplace remains problematic (Holding 1991; Robinson & Robinson, 1989).
- ▼ In education, skills are regarded as inferior to theoretical knowledge. Skills are associated with practical work, reproductive routines and subordinate to theory (Schrag, 1992).

The transfer problem can be resolved by establishing a close relationship between the workplaces in the department of radiation oncology and the skills lab. Furthermore, the learning climate within the department is of pre-eminent importance for benefiting from the high cost training programmes in the skills lab.

The appreciation of skills, in relationship to abstract theoretical knowledge, needs a fundamental re-framing of our concepts of knowledge and skills. Probably, we gradually will have to admit that skills and competencies should be regarded as a superior type of knowledge than the traditionally overestimated 'theories'.

Measures for effective transfer of skills

In the context of corporate education, we define the term curriculum as: 'the course of action open to an organisation, for influencing the necessary competencies of employees, that contribute to goal-oriented changes in their performance and in their work environment, thus striving for a desired impact on the organisation, by applying planned learning activities and the resulting learning processes' (Kessels & Plomp, 1997). Ultimately, a curriculum is effective when it leads to improved performance in the work environment. To enhance the transfer of newly acquired skills two main approaches of curriculum development are available: a systematic approach and a relational approach.

A systematic approach

The curriculum should be designed in a systematic way. Such systematic approach entails the following aspects:

- ▼ Conduct *needs assessment*. Identify ideal and actual performance and performance conditions, and determine causes of discrepancies. Employ strategies for analysing individual and organisation behaviour.
- ▼ Perform *job and task analysis*. Employ analysis strategies and reporting procedures. Investigate best practices, the inherent cognitive models and attitudinal aspects.
- ▼ State *instructional objectives*. Transform job requirements into objectives, so that performance measurement and selection of instructional strategies is facilitated.
- ▼ Develop *performance measurements*. Transform needs, performance requirements and objectives into evaluation criteria and appropriate assessment instruments.
- ▼ Sequence the performance objectives. Draw a blue-print for the desired *learning environment*, appropriate for achieving the desired changes of performance. Develop models for acquiring complex technical skills and their supporting mental maps.
- ▼ Specify the *instructional strategies*. Devise instructional interventions to put the blue-print learning environment into action. As specific man-machine interactions and interfaces are required (e.g. radiotherapy planning, moulding and operating the linear accelerator), the learning environment should enable learning processes for appropriate cognitive operations as well as for psycho-motor operations.
- ▼ Design *instructional material*. Develop simulator devices and software, print, audio-visual or electronic-based learner materials, job aids, trainer guides and plans to facilitate the instructional interventions.
- ▼ *Evaluate* the educational interventions. Appraise the instructional methods, sequences, materials and equipment, and improve.
- ▼ *Assess* training results, performance improvement and the related impact on the organisation.

However, the systematic and analytical approach to curriculum design, and the resulting formal curriculum is not very often found in reality (Andrews & Goodson, 1980). Even when developers apply the prescribed systematic design procedures, programme implementation remains problematic (Kessels & Plomp, 1997). Apparently, the unilateral, systematic approach does not guarantee success.

A relational approach

The relational approach provides activities that challenge stakeholders to become involved in the design and implementation process of a training programme and that reveal their perceptions of what the central goal is and how it can be achieved. The assumption is that if the mutual perceptions are made explicit, they can be modified and slowly become compatible. When skilfully applied, the

relational approach leads to a consensus among parties involved on methods of solving the problem, implementing the programme, and creating favourable transfer conditions in the day to day work environment (Kessels & Plomp, 1997).

In the relational approach participants in the curriculum project are invited to talk, discuss and argue about their beliefs, ideas, theories, aims, images and potential procedures concerning the curriculum. When a group achieves clarity and consensus about these constituent elements, they move into a phase of deliberation. Walker (Walker, 1971, 1990) specifies that the process of deliberation includes exploring specific conditions, generating alternatives, examining costs and consequences and selecting a feasible alternative. These development phases involve intensive exchange of ideas and beliefs.

Reaching consensus is essential for moving into the next phase, but can become an extremely difficult task, especially when participants stick to their fixed perceptions, or when they feel uncomfortable when the chaos of conflicting ideas and images can not be resolved in time. When the project group does reach consensus about the basic principles of the curriculum, they move into the design phase which includes the decision making about specific content, instructional strategies, equipment and materials. In this process of curriculum design it is extremely important that participants make their individual beliefs and values explicit as well as their perceptions of the instructional task and their assertions about how to proceed. The importance of the relational approach is that it recognises the variety of beliefs, aims and images that participants in a project on curriculum design adhere to. This variety of perspectives may frustrate a rational, systematic and linear design process.

As curriculum affairs are mainly activities involving human beings communicating with each other, the relational approach applies to all the contacts between the curriculum developers and relevant stakeholders. Besides senior managers, supervisors, trainers and trainees, other parties may be involved, in particular clients, customers, co-ordinators, sponsors, and opinion leaders. Unlike the systematic approach with its clear and rigorous logic, the relational approach may often seem fuzzy, using informal networks, balancing power and influence, and striving for consensus within the limits of culturally determined feasibility. Political awareness, cultivating support, developing relationships and gaining visibility seem to be ingredients of this aspect of curriculum design. Activities that belong to the relational approach are sometimes characterised as "walk and talk the job" (Harrison, 1992).

The most salient competencies that professionals should dispose of when they enter into the relational approach are listed below:

- ▼ Communication skills: listening, observing, interviewing, relating to others, self-expression and exchanging constructive feedback.
- ▼ Project management skills: leadership and chairperson skills, planning, monitoring and negotiating skills.
- ▼ Consulting skills: building open collaborative relationships, clarifying mutual expectations and responsibilities, and the ability to influence others and gain commitment.
- ▼ Facilitating change: encouraging widespread participation in the design and implementation of a project, and dealing with friction and resistance.
- ▼ Experimental flexibility, self-insight and self-esteem.
- ▼ Ability to create an atmosphere of tact, trust, politeness, friendliness and stability.

The competencies for a relational approach facilitate the developer's activities in the domain of interpersonal dynamics of decision making about educational planning. The relational approach involves social intervention and skilled communicative interaction. The developer organises meetings and interviews managers, supervisors, employees, potential trainees and trainers. These procedures entail consulting with concerned parties, problem solving, negotiating, reaching a consensus, gaining support, and strategically applying gentle pushes and decisive pulls. The goal of these efforts is to achieve a consensus among parties involved on methods of solving the problem, implementing the programme, and creating favourable transfer conditions for learning in the work environment. Several procedures may support the relational approach, such as there are: project management, rapport-building activities during needs assessment and task analysis, involving line management in the development process, creating similarity between learning situation and work environment, recruiting trainers with practical experience in the subject matter field, and the selection of trainees.

Research on curriculum design (Kessels & Plomp, 1997) showed empirical evidence that skilful application of the relational approach has a significant impact on the success of educational programmes. In particular, elements such as: creating learning situations that mirror the work environment, involving line managers as the prime educators, recruiting experienced colleagues as trainers and creating favourable conditions for programme implementation, appear to be of major importance.

Is Knowledge a Skill?

The transition from a subject matter-based curriculum to a competency-based curriculum.

Recent changes in the system for vocational education are based on the idea that the curriculum should focus more on competencies like learning to learn,

interactive skills, communication skills, information processing, problem solving and reflective skills (Kessels, 1996). These are prerequisites to participate in a society where physical labour and routine tasks are gradually being replaced by information and knowledge as the most important value adding processes. This shift in the importance of the content of a curriculum is based on a fundamental redefinition of knowledge in education. Learning is no longer a matter of absorbing, storing and retrieving of relevant subject matter expertise in books and other media. The assumption that knowledge is a subjective skill, that one can not convey, but that has to be acquired by every individual anew, underpins the search for a competency-based curriculum. In a competency-based curriculum the central issue is not the content, but the assessment of the acquired skills: how can the trainee prove that he or she has developed the competencies that are needed to perform and to survive in a rapid changing workplace?

It will be extremely difficult to define the competencies that contribute to the employability of young people and that help to reduce the insecurity in an unstable risk society (Beck, 1986). However, a fruitful participation in this analysis means that there is some consensus about the assumption that a knowledge society does not ask for the reproduction of culturally and historically determined facts, nor for the abstract and theoretical knowledge, but searches for applicable, and value adding competencies. The development of a competency-based curriculum for a department of radiation oncology should take the actual changes in the work environment of radiotherapy technicians as a starting point.

Identifying ideal and actual performance and performance conditions, and determining causes of discrepancies, may reveal critical competencies. Investigating best practices, the inherent cognitive models and attitudinal aspects will lead to a better understanding of the expertise of an experienced radiotherapy technician, and the problems that novices encounter. Transforming the performance requirements into evaluation criteria and appropriate assessment instruments, will shed light on how successful training programmes can be defined. All these activities are not the exclusive responsibility of training staff. According to the principles of the relational approach line managers of the various preparation and therapy units should take the lead. Building a learning environment that simulates the work environment is a powerful strategy to acquire job relevant competencies in a safe and efficient way. Creating favourable conditions for programme implementation in the planning and therapy units is a prerequisite for applying these competencies in day to day practice. Creating a positive learning climate within the units is probably the most important condition of all. A sophisticated

skills lab can never compensate for the lack of a stimulating learning climate in the workplace.

On this special day that marks the retirement of Mrs. Ricky Hartkamp, it is a true honour to deliver this speech on the developments in education and training. I enjoyed the privilege to visit the Department of Radiation Oncology and the skills lab, Mrs. Hartkamp being my personal guide. Without doubt, it appeared that she, better than anyone else, understood the importance of the relational approach in curriculum development. Getting senior and line managers involved, simulating the work environment in training programmes, creating favourable conditions for transfer, and caring for a positive learning climate in the department, Mrs. Hartkamp nurtured these activities in a natural way. The new horizons in stereotactic radiotherapy will look dim and far away without her dedicated commitment to human resource development in the Department of Radiation Oncology.

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