

\* Research in Progress

## **A SCIENTIFIC AND TECHNICAL INFORMATION APPROACH TO HEALTH EDUCATION**

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### **Abstract:**

This paper describes the epistemological approach that guided the launch of the first Comprehensive Post-Graduate Course on Health Information Science and Technology in Brazil. Despite evidence of the fundamental role played by human resources in any health system, nations around the world face a growing gap between the challenges of improving health and the capacity of health personnel to address these challenges. Closing this gap is particularly crucial in relation to the translation of research into practice. Therefore, the development of specific competencies for managing scientific and technological information has emerged as a priority on the political agenda. Based primarily on the information science perspective, the course has already trained 272 health professionals since its inception with diverse profiles derived from various health practice contexts; in addition, the course plays an important role in the promotion of partnerships and collaboration in an environment that values continuous learning. This diversity enabled a series of creative and innovative proposals, each characterised by a deep sense of social responsibility.

**Keywords:** Health education; human resources for health; health information science and technology

### **Introduction**

Health, science and technology are recognised as key factors in a nation's economic and social development. The centrality of scientific knowledge in contemporary society bears the indelible stamp of *action*. *Knowledge that leads to action* places emphasis on a continuous process that entails the innovation, creation and re-creation of knowledge through learning and through action or practice. The process of translating knowledge into action speaks to the importance of information - information as product, content and meaning and information as process, flow and relationship - in any strategy for strengthening networks of cooperation, thus weaving a mesh of collective intelligence. Therefore, there is a strong emphasis on the human aspect, in terms of the person acting on the knowledge, and on the power of action.

Particularly in the health sector, experts unanimously emphasise that human resources are a critical component in achieving and executing public policy for the sector. Experts also warn that the growing attention devoted to health in most Western countries has not been accompanied by the necessary careful investment and training in human resources. This problem may be a contributing factor to differences in quality, inequitable distribution and a lack of coordination between the various actions related to prevention, promotion and care, which compromises the efficiency, effectiveness and efficacy of health programs and strategies (HANNEY et al., 2002.)

This scenario is even more challenging in that strategies for maximising the connection between research and practice in health are becoming a priority on the political agenda, thus strengthening the link between *knowing* and *doing* in health systems. Here, information processes gain importance, and specific skills and competencies are required for particular activities, such as the promotion and definition of the information flows needed to connect the different actors. The completion of these activities leads to the integration, complementarity and synergy of knowledge, providing dynamic and stimulating innovation in the health system. This issue represents both the scenario in and the challenge for Brazil.

Against this backdrop is the pioneering initiative of the Institute of Communication and Scientific and Technological Information (Instituto de Comunicação e Informação Científica e Tecnológica - ICICT), a teaching and research unit of the Oswaldo Cruz Foundation - Fiocruz, to design and launch the course **Specialisation in Health Information Science and Technology** (Informação Científica e Tecnológica em Saúde - ICTS) in 2004, which is a major contribution to the national effort to promote the link between scientific discovery and health policies and practices.

## **Knowledge in the contemporary world**

In *The world as I see it*, originally published in 1953, Albert Einstein warned society that it would inherit responsibility for technical, intellectual and social progress so crucial that our best efforts would be required to ensure that this inheritance became an opportunity rather than a misfortune. Einstein emphasised that intellectual competence and ingenuity were situated more strongly in the material sphere than in the human sphere.

The paradox and challenge persist for heir and witness. The speed of technical, intellectual and social changes suggests the use of a linear temporal perspective that extends from the past to the future. Extraordinary advances in science and technology (S&T) have produced profound impacts in various human practice fields. S&T's promise and commitment as a generator of wellbeing, freedom, equality, autonomy and dominion over time provides society with the opportunity to realise its full human potential.

The so-called Information Society has two primary features. First, its support base is founded on scientific knowledge, with its capacity for immediate evolution towards productive forms of knowledge. Second, as the result of mutations and flexible and pure power, knowledge is presented as a *capacity for action* (STEHR, 1995). As a *capacity for action*, knowledge is only a possibility: it may be unused or used for somewhat irrational purposes.

The greatest paradox perhaps lies here: to use knowledge, knowledge must be suspended. The physical realisation, implementation and use of knowledge depend on the intellectual, social and economic conditions in the place where knowledge is woven. The translation of knowledge into action demands active and purposeful elaboration. At this point, the Knowledge Society reaches the limit of its promises: knowledge is potentially a source of both progress and exclusion. The alternative encompasses education, work and knowledge for and through action and intervention in the world.

The centrality of education in the contemporary world has altered the priority agenda of decision makers from developed and developing nations. Placed under increasing pressure by the need for continuous learning, the speed of introduction and the impact of new technological configurations in the various sectors of society, education emerges as fundamental to the development of strategies that promote and strengthen the interaction among politics, research (knowledge) and practice (doing). This proposal lies comfortably within Paulo Freire's theoretical framework (GADOTTI, 1996).

Politics' key role is grounded in the assumption that every educational act has a political nature. In other words, education is not neutral because there cannot be an educational proposal that is simultaneously in favour of all social groups in a society. Therefore, policies must be viewed as instrumental and ideological orientations that guide research and the production of knowledge and their associated practices. Policies

assume the duties of promoting synergy and strengthening interfaces to stimulate the production of knowledge that can meet the needs of the working world.

Integrating knowledge production at the heart of practice is the point of both departure and arrival; it is cause and effect, as practice is the context of the competence and skills that enable and demand learning by doing or doing while learning. The primary characteristic that defines the professional profile of the Information Society is learning capacity.

Finally, practice and research feed back into public policy making, and this connection must be strengthened, if not built. The worlds of knowledge and experience constitute the source of the re-contextualisation and the production of new knowledge and the power to do so. As they constitute a type of power, knowledge and experience should be strategically guided by policies so that existing competencies can be utilised to the greatest extent. To the extent that this power is rarely used, the cycle of education is incomplete (HANNEY et al., 2002).

Therefore, education must accomplish a dual task: on the one hand, it must account for the generation and ownership of specific content in the context of action and, on the other hand, it must position itself at the service of the necessary and indispensable interaction and integration among research-practice-politics. In other words and, from the epistemological perspective, in addition to being disciplinary, education should stimulate lateral movement and communication between knowledge and practice.

## **Education and competencies for the health field**

Morin (2000)<sup>4</sup> discusses a broad, deep and serious inadequacy among fragmented and limited knowledge in various fields, in which problems are multidimensional, polydisciplinary, global and planetary. It is imperative to develop a new perspective on education that facilitates the development of organising principles that can link the dispersed knowledge and provide it with meaning.

Although leading to a super-specialisation of knowledge, allowing for a detailed understanding of the processes of nature and life, the current dynamics of scientific-technical development crop and compartmentalise an esoteric and anonymous knowledge that is restricted to quantitative and formalised experts. Generating a previously unthinkable volume of encoded information, this dynamic empowers action whilst simultaneously impoverishing it. This dynamic empowers local, focal action; the dynamic impoverishes global, systematic action, as it leads to a cacophony and a near impossibility of making sense of a complex world, where the global fabric is formed only by things that exist at a local level. The alternative can be found in the movement of complex-inter-multi-trans-disciplinary approaches, among which there is an implicit concept of cooperation and an object and a project that are shared by several disciplinary perspectives.

This epistemological perspective launches a new model of knowledge construction, Mode 2, proposed by Gibbons et al. (1994). The one form of the production of disciplinary, hierarchical and academic knowledge renders it necessary to develop a transdisciplinary, heterogeneous, heterarchical and reflexive knowledge that is woven together in a context of application and, therefore, more highly subject to the social criteria of evaluation. Such a view leads to a research practice that, as a process of knowledge production, should *conserve* (discipline) and *exceed* (transdiscipline). Conversely, in the words of Stokes (1997), the practice must be *strategic*, with a double intention: to seek the fundamental understanding of processes and events, including the promotion of the efficient use of results, and to obtain economic and social benefits.

Research's strategic nature is fundamental to the health field, as recommended at both the 1st and 2nd National Conference on Science and Technology in Health (CONFERÊNCIA..., 1994, 2004), when the National Policy on Science, Technology and Innovation in Health (Política Nacional de Ciência, Tecnologia e Inovação em Saúde - PNCT&IS) was adopted as an integral part of the National Health Policy. This strategic nature translates into the need to ensure that research generates knowledge that facilitates the elimination of local health problems and that this knowledge can be disseminated by the various spheres of action that support health, resulting in better living conditions: "(...) *necessary to make knowledge work for equity in health [...] the fate of research results is to be appropriated by health services, by industry and by society* " (Goldbaum, 2006, p.3). This process implies the absorption of knowledge and the optimisation of processes and practices in an environment composed of various social actors in various settings and operating environments, from university to industry and from basic health units to sophisticated research centres.

The strategic nature of synergies between research agendas in health and those in the health system constitutes an important point on developed and developing countries' political agendas (MOREL, 2004). As Guimarães (2005) noted, in the case of Brazil, although health research historically and quantitatively represents the largest sectoral component of research in the country today, its development has occurred in a manner that is divorced from health policy. Health research must be encouraged to meet the demands and guidelines of the Unified Health System (Sistema Único de Saúde - SUS) in an effort to achieve complementary logics, combining care and the provision of services with the production of certified knowledge.

The supply of trained professionals who can intervene in favour of integration and complementarity, which stresses the vital importance of information to the facets of **product** and **process**, is thus essential. The emphasis on translating knowledge into action, building bridges between what is known and what can be achieved, organising and structuring information flows and channels to facilitate mutual learning and collaboration and providing equitable access to public information for various social actors in appropriate formats and languages represent only part of what is required to enable us to identify the lacunae that must be closed through the use of practices that configure information products and processes that are necessary for full health promotion.

In part, it is also to meet this need that SUS, especially through the Department of Labour and Health Education, has been designing and proposing education policies for health professionals using a logic characterised by meaningful learning that promotes and produces meanings, thus transforming professional practice through critical reflection and network action. Lifelong learning implies the production of knowledge based on and driven by work, a process in which learning and teaching overlap. As a privileged locus of research and strategic knowledge, education should have a transdisciplinary character typified by a commitment to developing the continuous capacity for learning and generating innovation by working in team matrices (MS, 2003).

This has been another challenge embraced by FIOCRUZ, an organisation that has been using its expertise over the years to train individuals for SUS. In addition to being a teaching and research unit in the fields of communication and health information science and technology, the ICICT also assumed the responsibility of formulating a comprehensive post-graduate course that would become a first step in developing training in health research, thus producing and encouraging the use of scientific and technological health information. The first course, **Specialisation in Health Information Science and Technology** (Especialização em Informação Científica e Tecnológica em Saúde - ICTS) was thus developed. The major goal is to strengthen health research, thus creating synergies and building bridges between research and health care practice through the use of information processes.

## **Information science and technology - IST**

From a functional perspective, Gómez & Canongia (2001, p.12) define information science and technology (IST) as "(...) *all the information that scientists and organisations in R&D [research and development] need to develop their activities; the information necessary to establish the links between knowledge generation and its use and uptake in different spheres of economy and society; requirements for education and scientific communication; links for interfaces between scientific and technological production and the state and its decision-makers in the planning and management of S&T; and, finally, information with the aim of increasing the participation of citizens and their organised expressions in the processes of elaborating public policy*". IST's social nature and collective and public dimension are illuminated when, within each context or sphere of activity, an *episteme* or knowledge domain is circumscribed, generating a process of production, circulation and the recursive use of knowledge, which comprise knowledge's **product** and **process** facets.

From this starting point, there are many complementary perspectives from which IST can be used as an object of study in the health field. Some of these perspectives are cited below:

- The access perspective, which seeks to identify the primary sources of information in the health field, whether they are formal or informal, structured or unstructured and public or private, and their respective characteristics, in terms of the following: scope and coverage, forms of access, languages of interaction and search strategies;
- The storage space, maintenance and access perspective, which encompasses such entities as libraries, archives, museums, information services, databases, patent offices and various virtual spaces;

- From the management perspective, which involves the approaches, methodologies, languages and technological solutions for the treatment, organisation, delivery and circulation of information (indexing, classification, terminology, architecture, protocols and standards, among other aspects) fundamental to the structure, operation and interoperability of information systems (IS) and virtual environments;
- The quantitative analysis of the scientific activity perspective, particularly the use of bibliometrics and scientometrics, to map and explain research efforts and networking among researchers, research topics and institutions and their relationships with local and social demands;
- The process perspective, within the scope of the National System of Science, Technology and Innovation (Sistema Nacional de Ciência, Tecnologia e Inovação - SNCT&I), to map the flows and types of information that structure and promote synergy and the complementarity of knowledge between different contexts, sectors and activities that trace the path from the production of knowledge to the use of knowledge;
- The socio-cultural perspective, to map the spread of scientific and technological advances in society; the public understanding of science, education and scientific culture; the encouragement of participation and social control and the consequent improvement of citizenship.

These perspectives, which can be grouped under the heading "information studies", are not exhaustive regarding the possible aspects of and approaches to events and "things" around the world that IST facilitates: as a starting point, a midpoint or an endpoint; as a cause or consequence; as a structure or dispersion; and as a product or process. Moreover, in isolation, none of these perspectives can resolve the complexity of cognitive, social, technical, economic and cultural processes and the multifaceted nature of subjects, objects and events under analysis. Each domain of knowledge (e.g., biomedical sciences, public health and biotechnology) and each activity context (e.g., a university, a research institute, decision making, the production sector and health care) lead to a perspective, a "problem" and an *episteme* in which it is possible to "read" the IST. Similarly, IST can illuminate specific and individual views of problem events in different areas of knowledge and activity sectors without exhausting their power of explanation or resolution. Information describes, articulates, structures and systematises. Whether as content or as flow, an act of communication or language, IST provides the framework and provides systems with both conceptual and real life facets.

Clearly, Information and Communication Technologies (ICTs) play a role in shaping possible readings that can be undertaken within the scope of "information studies". Superlatives aside, it can be said that, in recent years, the entire value chain of information (access, organisation, communication and use) has undergone a profound reconfiguration. The exhaustively proclaimed concept of the Knowledge Society is intrinsically linked to advances in ICTs and to the ubiquity of their applications, from personal computers to the Internet and from electronic databases to mobile communication devices and information exchange. The growing and almost unmanageable volume of information, a result of the acceleration of the dynamics of the scientific enterprise, in terms of both vertical (specialised) and horizontal (inter, multi and transdisciplinary) actions, competes for the stock, circulation and appropriation of knowledge as it develops new forms of organisation and mediation. However, the increase in the provision of IST does not imply a direct increase in consumption or use thereof. Rather, the "paradox of excess", or the information overload, paralyses more than it leads to action. Therefore, a shift in the definition of competencies occurs, and the concept of informational competence gains strength: "*to be information competent, a person must be able to recognize when information is needed and must have the ability to locate, evaluate and use information effectively... information competent persons are those who learn to learn*" (American..., 1989, p.1).

Although coloured with shades of political emancipation, information competency extends beyond a simplistic view of an alleged favouritism towards those normally viewed as being marginalised and excluded, particularly from an economic and cognitive standpoint. More fundamentally, information competency redefines an excluded individual as one who does not invest in *lifelong learning*, which extends beyond a set of skills that allows for the best use of ISTs to access and use information and develops an ethical, responsible and sustainable stance in the interaction between knowing and doing.

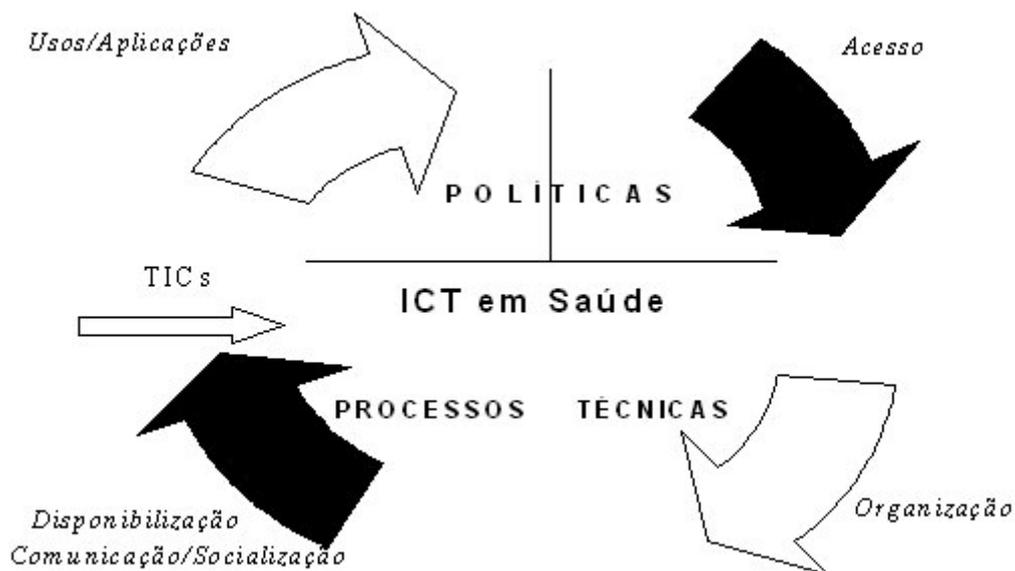
## Specialisation in Health Information Science and Technology

The epistemological principle guiding the Specialisation in Health Information Science and Technology course is based on what Morin (2000) calls "educational teaching", which is not restricted to the transmission of knowledge but rather is a culture that encourages the practice of thinking guided by a perspective that extends beyond subject boundaries. Educational teaching moves beyond didacticism, stimulating autodidacticism and motivating and promoting the autonomy of thought. Although graduation fulfils the duties of the conservation, memorisation, ritualisation and construction of cultural heritage, favouring disciplinarity, post-graduation should challenge the student to overcome subject fragmentation, thus encouraging the articulation of knowledge trapped within subjects' hierarchical boundaries.

By their very nature, object and practice, Information, Health and S&T are fields of knowledge that rebuff disciplinary closure. These fields demand hybridisation, agglutination and aggregation. From this perspective, the Specialisation in Health Information Science and Technology course has the following goals: to build a transdisciplinary project and object, i.e., the domain of health information science and technology itself; to develop proposals for intervention and problem solving; to stimulate exchange and cooperation; and to conserve and transcend contexts, instrumentalities and technologies, thus building and transforming social meanings.

The general objective of the Specialisation in Health Information Science and Technology isto contribute to performance improvement for the institutions included in SUS through the training of professionals operating in the various activities linked to the production, organisation, availability, use and analysis of scientific and technological information and associated technologies. The Specialisation course's structure was driven by the construction of the field covering four fundamental aspects: modelling/circumscribing the IST field for health (**Conceptualisation and Context**); sources, methodologies and techniques used to work with information (**Access, Organisation, Systems, Networks and Architectures**); IST processes/flows (**Communication, Availability and Socialisation**) and the analysis, use and applications of IST for health (**Uses/Applications**). Two themes transect the field as a whole: **Politics** (of S&T, Information, Communication and Health) and **ICTs**. Below, Figure 1 represents the relationship between these thematic aspects.

**Figure 1** - Theoretico-conceptual structure of the Specialisation in Health Information Science and Technology



The fifth thematic aspect, "**Research methodology**", one of the cornerstones of the Specialisation course, is constructed of activities developed in parallel and throughout the course, totalling 420 (four hundred and twenty) hours. The curriculum also contains three **Seminars**, which have the aim of developing issues rated as important, and a set of external activities, which have the aim of further clarifying complementary contexts and practices in health information science and technology. Three **workshops** are offered as elective disciplines: the Workshop on Scientific Writing, the Workshop on Bibliographic Referencing and the Workshop on the Presentation of Scientific Work.

At the end of the course, students must submit a **Research Project** proposal of a strategic nature or an intervention project. The project must be linked to the student's area of professional practice. This project's aim is to create real possibilities for the future development of research or even subsidisation of the continuation of specific post-graduate academic training.

## Conclusions

The Specialisation in Health Information Science and Technology began its activities in a decentralised manner, with classes in Rio de Janeiro and Porto Alegre. By 2011, thirteen classes have been completed at the two centres, serving a total of 272 health professionals with various professional profiles: librarians, archivists, journalists, doctors, dentists, nurses, psychologists, systems analysts and engineers, among others, from various contexts of health practice. This diversity has produced a series of creative and innovative proposals, which are diamonds in the rough whose brilliance and value must be assessed with a deep sense of social responsibility.

*Meta-disciplinarity* exercises are conducted daily during the course. With these exercises, the uncertainty and incompleteness of knowledge are discovered and greeted with hope and determination.

In 2012, through a process of constant and periodic assessments and the coordination of staff and students, the course has undergone its first redesign in a shift towards a more concise format (a workload of 360 hours) without a loss of content. The first class using this new format began in 2012 on an experimental basis. This format is more focused on the management of health information.

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