

Vaidya-scientists: catalysing Ayurveda renaissance

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Commonsense, logic and clarity provide an ageless quality to Ayurveda knowledge for health care. Ayurvedic institutions along with its teachers, students and practitioners are in despair – a crisis similar to that faced by contemporary Western medicine compatriots. We envision vaidya-scientists, a scholarly group of change agents, who are well versed in the richness of the Ayurveda classics – and the details and insights of modern biology. While acknowledging the need to create physician-scientists in India, we portray here a tentative roadmap for creating Vaidya-Scientists as ambassadors to catalyse a much needed Ayurveda renaissance to invigorate and renew its teaching, research and practice.

Keywords: Ayurveda, health care, renaissance, vaidya-scientists.

THE state of global health has been an issue of concern, especially due to ever-rising costs and challenges to control communicable and non-communicable diseases as double-burden. There has been growing disenchantment with the high-tech and pharma-centric health care. As a consequence, health-seeking behaviour studies are clearly demonstrating public demand for a new pluralistic health-care system, which can creatively integrate different proven health knowledge systems of the world. Importance of innovative practices and policies to address health-care needs of resource-poor people is also being widely discussed¹. Complementary and integrative approaches have gained global acceptance and several governments and universities from many countries, including the Americas, Europe and Australia, have established national institutions for integrative medicine. India can be the world leader in this sector because of the immensely rich knowledge systems like Ayurveda alongside the well-established practices of Western biomedicine and life sciences. The thought-provoking interview with Valiathan indicating the need of innovation in medical education, legacy of Ayurveda and importance of interdisciplinary approach in research and practice remains a guiding inspiration for many².

Physician scientists: integrating science and medicine

Critics argue that medical colleges produce graduates not well equipped to tackle the health-care needs of our society. Medical graduates generally possess theoretical knowledge of medical science; however, clinical and problem-solving skills that form the core of clinical competence are often inadequate. Practising doctors are not sufficiently able to integrate the advances in basic sciences and research with clinical disciplines³. The contributions of basic sciences in the progress of medicine are well known; however, the integration of research, science and medicine in India is grossly inadequate. The need to create a new generation of clinical researchers who will enjoy and practise the confluence of science, engineering and medicine has been recognized. Creating physician-scientists as a new generation of clinical researchers by building an interface between science and medicine is critical⁴. The present situation in Ayurvedic education seems akin to the status of medical education in India today, as well as in the United States prior to the landmark report of the eminent educationist Abraham Flexner, which highlighted the importance of educating physicians⁵. The intensity and need of creating physician-scientists have been advocated at many fora^{6,7}.

Vaidya-scientists

The Ayurvedic sector has even more intense challenges due to several reasons. First, the post-independence strategies in Ayurveda education have not consistently resolved to strengthen the Shastra base. Second, the Ayurveda system has not yet become the mainstream, nor

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does it coexist with modern medicine as in China⁸. Third, policy dominance favours modern medicine, leading to marginalizing Indian systems of medicine. This article highlights key issues related to education in the Ayurveda sector and tries to address possible resolutions through appropriate pedagogical approaches. The article also discusses the need to strengthen scientific insights and research components of the present curriculum to create qualified and knowledgeable vaidyas, who are equipped with a positive attitude, mindset and relevant skills of scientists⁹. A major exercise to reform the medical school and residency programme to educate physicians in the US¹⁰ is relevant to create vaidya-scientists in India. We argue that educating Ayurveda physicians as scientists requires an innovative approach where traditional and modern pedagogies are balanced and appropriately blended.

The legacy of openness

Historically, Ayurveda has been progressive and inclusive, adopting an integrative approach to other systems. As stated in *Charaka Samhita*, 'The science of life shall never attain finality. Therefore, humility and relentless industry should characterize your endeavour and approach to knowledge. The entire world consists of teachers for the wise. Therefore, knowledge, conducive to health, longevity, fame and excellence, coming even from an unfamiliar source, should be respectfully received, assimilated and utilized'¹¹. Ayurveda and biomedical sciences share the same spirit of open and sincere scientific enquiry; yet their perspectives on the nature of the human and universe are different. Their basic philosophy, logic, ontology, epistemology and biomedical theories are distinct. Various *Darshanas* (dominant schools-of-thought systems), including *Sankhya*, *Nyaya*, *Yoga* and *Vaisheshika*, form the philosophical foundations of Ayurveda. Basic concepts like *Panchamahabhuta* and *Tridosha*, *Loka* and *Purusha* indicate that the holistic nature and macrocosm-microcosm continuum is central to Ayurveda.

On the other hand, biomedical science uses Aristotelian logic and the reductionist approach to guide its propositions. Cellular and molecular biology govern its medical theories. These epistemological differences have resulted in a situation where each system needs discovering, verifying and structuring knowledge in a diverse manner. Ayurveda is basically pragmatic, systemic and holistic, whereas biomedical sciences have been theory-based, structural and reductionist¹².

Ayurvedic pedagogy

In olden days Ayurveda teaching was mainly offered through a Gurukula system. Curiosity and research were regular aspects of learning from the masters. Holistic rationale, bedside explanations and the use of five Prama-

nas (described in later sections) to diagnose and treat disease are fine examples of pedagogical approaches¹³. Ayurveda has advocated four levels of teaching: *Adidhi* is the first step when information is just absorbed; the second is *Bodha* that involves deeper understanding and gaining knowledge; the third is *Acharana* meaning practice, and the fourth *Pracharana* meaning preaching, advocacy or dissemination of knowledge¹⁴. The problem lies in jumping from *Adidhi* to *Pracharana* without *Bodha* and *Acharana*, when teachers preach without practice.

Such a systematic and profound pedagogical approach leads to the creation of well-trained Vaidyas in the Gurukula system. Understanding, preserving and adopting rich practices from living traditions like Ashtavaidya of Kerala are also important¹⁵⁻¹⁷. The challenges to pedagogy are intensified, especially due to the feasibility issue for the growing large number of Ayurvedic colleges. One path envisaged is to first train the selected faculty through a residential and on-line fellowship programme for vaidya-scientists. The trained faculty could then transfer the positive aspects of the Gurukula system to their respective colleges. This would enhance the original Ayurvedic pedagogy, at the same time enriching the future education and human resource development efforts.

Ayurveda education: present status

The development of Ayurveda education from 1870 to 1970 has witnessed several policy reversals by various Government committees. The Central Council for Indian Medicine (CCIM) was constituted by an Act of Parliament in 1970 and the Ayurveda curriculum was made uniform across the nation. Yet, today, Ayurveda education is in a state of crisis. The Department of Ayurveda, Yoga, Unani, Siddha and Homeopathy (AYUSH) is concerned that the majority of qualified Ayurvedic practitioners have resorted to practising Western medicine. The confidence to practise *shudha* Ayurveda seems to be slowly building, but is far from satisfactory. Efforts are underway at multiple levels to bring about reforms. Over 500 Ayurveda teachers have suggested a variety of changes in the curriculum during a recent workshop in Bangalore, which are under active consideration of the CCIM (http://www.ccimindia.org/colleges_status_ayurveda_2010-11.php).

Most Ayurveda institutions are teaching schools with meagre research infrastructure or activities. The infrastructure, both physical and human resources, is below the required levels in majority of these institutions. In 2010-2011, CCIM recommended that not more than 100 Ayurveda colleges be permitted for undergraduates or postgraduate studies¹⁸. Students barely receive appropriate training in modern tools like biostatistics and bioinformatics. The transformation from the earlier Gurukula

system to the present-day colleges producing thousands of Ayurveda graduates has led to significant pedagogic distortion. With over 240 colleges now offering Bachelor of Ayurvedic Medicine and Surgery (BAMS), and nearly 100 graduate colleges offering Doctor of Medicine (MD) in Ayurveda, the state of education, training and research is far from satisfactory. To stem this decline, Ayurveda teachers need to be adequately trained in clinical skills, research methods and documentation rigour¹⁸.

The present-day education appears to have not only segregated the cultural and traditional pedagogy practices, but has compromised the link between research and teaching. Ayurveda graduates, who play an important role in India's primary health care delivery system, are inept at basic clinical examination and skills¹⁹. There is urgent need to transform the theory-oriented and textbook-dominated teaching into clinically-oriented practical training²⁰. If classroom-based teaching transforms into patient-centric co-learning, it would motivate students towards a lifelong passion for self-learning.

An interface between Ayurveda Shastra and biomedical sciences is necessary for creative dialogue amongst medical professionals of different systems of medicine. Unfortunately, most students lack also a theoretical foundation in either of the above. There is lack of exposure to contemporary advances and to disciplines like public health, cell biology, epidemiology, biomedical engineering, pharmaceuticals, clinical pharmacology, immunology and pharmacogenomics amongst others. In view of the exciting potential and synergy of the seemingly contrasting medical systems, a new cadre of 'vaidya-scientists' is needed⁹.

Gurukula to Kulaguru: a tradition in transition

The traditional Gurukula system involved close and significant interactions between a 'Guru' (teacher) and his 'Shishyas' (students), providing the latter with unique opportunities for imbibing the teacher's virtues, learning style and clinical experiencing of Ayurvedic verities. On the other hand, the present university system led by the Vice-Chancellor as Kulaguru, focuses more on value of the 'seat time' and memory recalls as measures of academic rigour, rather than actual learning and personality growth as the gold standard. Buildings, departments and clinics are organized more for regulatory compliance, with insufficient evidence supporting their practical use. The earlier rigour and spirit of scientific inquiry for discovery are largely missing in Ayurveda education and practice.

Flexner's report⁵ of 1910 is relevant even today because it proposed a unique model of medical education connecting research and practice. In a critical review following recommendations of this report, many American medical schools were found to be lacking this required

standards and nearly half the number of such schools were merged or discontinued. The report also concluded that there were too many medical schools in USA, and that too many doctors were being trained. India's situation is seen similar following the National Knowledge Commission Recommendations on Education²¹ and the Yash Pal Committee Report²² that led to a critical review of the Deemed University system²³. As a consequence, regulatory reforms involving the University Grants Commission, the All India Council for Technical Education, the Medical Council of India, CCIM and other such councils are under active consideration at the highest levels²⁴.

Earlier efforts towards integrative education in Ayurveda were half-hearted leading to 'integrated' medical practitioners with qualifications like GFAM and BAM&S, who primarily practised allopathy, and focussed on the use of injections and antibiotics. There is an urgent need to rediscover the right approaches to reform and strengthen the quality of education in AYUSH systems. Experiences and learning from Gurukula and Kulaguru systems must be considered and evaluated for their adoptability vis-à-vis the large number of Ayurvedic institutions. For this purpose, the Gurukula and Kulaguru systems are compared and contrasted in Table 1 for a judicious discussion of the plausible points in training vaidya-scientists: first for the faculty and later for students. The exercise is not meant for mere revivalism, but for a genuine renaissance in Ayurvedic education, services and research.

The process of dynamic integration of new knowledge in Ayurveda has slowed down during the last two centuries. In contrast, modern medicine has evolved rapidly, embracing new technologies, drugs, reliable diagnostics and therapeutic options. Pedagogies which connect the concepts and theories of Ayurveda with those of biomedical science to achieve state-of-the-art integrated outcomes in diagnostics, prognostics and therapeutics, are much needed.

Pedagogies for conceptual understanding: strengthening the Shastras

Ayurvedic pedagogy has a complex challenge for inculcating a deeper understanding of the Shastras as well as to transmit the concepts of scientific basis of decisions at the bedside. Clinical problem-based learning would strengthen the Shastra base vis-à-vis clinical scientific make-up. The reaffirmation of their past legacy is in no way mutually exclusive to scientific preparation for meeting future technological challenges. Education in Ayurveda requires planned approach from the pre-secondary level for students with positive attitudes and inquisitiveness towards Shastra and science. Knowledge of Sanskrit and correct understanding of the basic principles, logic

Table 1. Comparison between Gurukula and Kulaguru systems

Gurukula	Kulaguru
Master–disciple relationship	Teacher–student requisite
Spontaneous life-oriented learning	Structured teaching of syllabus
Personality and individual potential	Uniform and mass education
Philosophy lineages	Technical expertise
Shastra-based adhyayan	Humanities/sciences-based adhyapana
Ethical growth	Professional excellence
Compassion: driving force	Commercial success: key motivation
Yogic calmness	Competitive stress
Harmony with nature	Disenchantment
Curiosity and creativity	Conformity and imitation

and philosophy should be transmitted primarily through a detailed study of *Brihat-trayi* using *Adhyayana*, *Adhyapana* and *Tadvidyasambhashana*.

An overall understanding of Ayurveda presents challenges due to an inadequate foundation in the Shastras. Three basic texts of Ayurveda, *Charaka*, *Sushruta* and *Vagbhata*, have a complex structure making their contents difficult to integrate sequentially, without the capacity to correlate with Shastric fundamentals. It is left to the student to figure out how the content in one domain relates to that in another, and how both relate to patient care. The study of *Tantra yukti*²⁵, neglected in the present curriculum, should be made compulsory since it holds solutions to complexities of this kind by providing keys to linkages connecting one term or sutra to others, and their interrelationships. It thus generates a holistic understanding of the subject in a clinically comprehensible manner.

Problem-based learning (PBL) is another better education tool at the postgraduate level. Rather than passive teaching, it is important to create an environment where students can actively learn problems on hand from Shastric deliberations. PBL is participatory, distributive and implemented in small groups, and empowers students to engage in self-directed clinical learning to promote collaborative team efforts in problem-solving²⁶. Such a model may also facilitate development of shared learning and reasoning strategies, which are widely used by physicians in sophisticated resolution of clinical challenges²⁷.

Pedagogies relevant to evidence-orientation

Research is the prime need of contemporary Ayurveda. However, scientific inputs should conform to the principles and philosophy of Ayurveda. Research should focus on the science of Ayurveda, rather than just scouting for new drugs or materials. Such research requires teamwork between scientists and vaidyas based on truth and trust. Ayurvedic research methodology requires a ‘whole system approach’, with protocols evolved through intense interface with modern science. Ayurveda needs research

designed to study fundamental concepts as well as treatments²⁸.

Ayurveda is an experiential science. In olden days students used to attain clinical skills through observation and follow the clinical practice of their masters. The practice of Ayurveda was founded on knowledge verified by five *Pramanas* as a path to knowledge. *Apta* involves an unbiased and intuitive acquisition of knowledge from the masters by a prepared and receptive mind of the student. *Pratyaksha* involves observational and objective data from the senses or their extensions, in the form of clinical or experimental findings. *Anumana* derives evidence from constant association, correlation and hypothesis. *Upamana* involves associative conjunctors, similes and analogies. *Yukti* covers intelligently designed interventions to test ideas and generate observations for deriving facts.

These *Pramanas* constitute a major component of epistemology in Ayurveda. This pragmatic and robust approach can ensure novel paths to validity and scientific rigour²⁸. Use of these *Pramanas* was directed towards resolving clinical as well as research problems. Relevant weightage to *Pramanas* should be a pre-requisite to developing appropriate research methodology in Ayurveda³⁰. According to Lasagna³¹, the founder of clinical pharmacology, traditional systems require a ‘different kind of evidence’ than the hierarchy of evidence in modern medicine. Ayurvedic statistics has been proposed as a new discipline based on *Pramanas*, falsifiability theory and three modes of validity – consensual, congruent and concurrent^{32,33}.

Pedagogy for clinical skills

The importance of theoretical knowledge, developing mastery over clinical skills and the relationship between the two are highlighted in classical texts. Sushruta, the master of ancient surgery, repeatedly lays emphasis on expertise and skills before entering into real clinical situations³⁴. Pedagogies for practice and performance generally allow learners to practise clinical skills and

procedures in realistic situations, but with more time, less risk, better and more important feedback¹⁰. However, the present curriculum lays too much stress on acquisition of knowledge rather than development of skills.

Students these days find it difficult to make diagnosis based on Ayurveda, as they are neither deeply trained in *Nidan Shastra* nor the rigour of history and head-to-toe examination as in modern examination. These limitations are further compounded because of non-corroboration of the physical findings by objective imaging, endoscopy, and investigative markers. Students use modern diagnostic techniques without grasping the basis of the tests and their clinically relevant interpretations. They need to be well trained to intelligently adapted integrative use of modern technologies and diagnostic techniques to observe and study the links between the findings and Ayurvedic correlates.

The need is thus for skill-based programmes that not only comply with the present-day demands, but align themselves with the philosophies of Ayurveda. Emphasis must also be laid on developing skills in human resource management, communication and leadership qualities. Introduction of simulators might be considered for developing expertise in the kind of performance skills delineated by Sushruta. In undergraduate medical education, simulators are particularly useful for developing basic psychomotor skills in routine situations for familiarizing learners with specific equipments and technologies, and for practising communication skills and roles in inter-professional teams. However, to provide such resources to thousands of students in Ayurveda colleges where basic facilities are also not adequate will remain a great challenge. However, this needs to be addressed by proper advocacy, influencing policy making at the highest level. Assessment of logical understanding and learning through experiment, and experience and practice in laboratories and clinics should be given priority over mere tests of memorization. The purpose of being immersed in texts should not just be to understand concepts and theories, but also to ensure that physicians learn to use scientific reasoning and reflect learning in clinical set-ups.

Pedagogies for inquiry and innovation

Enquiry and investigation have remained the major strengths of the Indian system since ancient times, where questioning and differences of opinion between authorities were exemplified by Nachiketa and Prahlad. However, the modern education system has greatly compromised the environment where students can ask critical and uncomfortable questions or challenge the teacher's interpretations. In the Gurukula system, apart from yogic development of the mind, memorization of texts, and service to the guru, teaching was mainly in the form of catechism: questions and answers between the student and

guru. This reinforced the curiosity of the student, promoted group learning and on occasions led to exploring the limits of knowledge. The required pedagogies were spontaneous and inherent in the Gurukula system.

Development of such a questioning mindset is an essential aspect of physician training, as much as inculcating lifelong learning, motivation to heal, and commitment to professional excellence. In medical education, pedagogies that inculcate such attitudes, knowledge and skills are inclusive of PBL and mentoring relationships. These provide models for long engagement with clinical, academic and research activities. The latter are also supported by research conferences, workshops and appropriate dissertations and theses. Clinical grand rounds on unusual cases can challenge students to explore research perspectives, or push the limits of their clinical understanding. Interactions with peers will stimulate them to search for new or alternative approaches to new knowledge to manage challenging aspects of patient care.

The present Ayurveda education system does not include the scope for critical analysis and innovation practices. As a result, it has pushed to the back seat the thrust for imparting deeper knowledge and understanding of medicine and medical practice, limiting the aspirations of students to examination outcomes, literally stunting their minds. The teacher is the foundation stone for any system of education. The Gurukula system imparted a bond of understanding between the shishya and guru. The teacher knew the strengths and weaknesses of all his pupils and worked with them. Emphasis was on developing student inquisitiveness. Unfortunately, many Ayurveda college teachers are not sufficiently motivated towards Ayurveda practice and have limitations to induce enthusiasm for deeper understanding in students. We need to produce physicians capable of, and intent on, generating new knowledge, and helping further progress of the Shastras and science. Curricular reforms, appropriate methods of selection and adequate training in teaching techniques would go a long way towards improving the quality of teaching³⁵.

Pedagogy for development of professionalism

Ayurveda has described in detail the desired qualities of its students, teachers and physicians. The code of ethics and conduct of physicians form the foundation of a responsible and competent healer. Psychosocial developments realizing the innate potential of students play a vital role in shaping future physicians. Vaidya profession also demands more responsible and humane values and attitudes. It involves far more than cultivating moral and ethical reasoning. It involves awareness of individual beliefs, emotions and values, and also of how these influence interpersonal interactions, and, finally the patients' well-being. The same was reflected in teaching under the

Gurukula system. The guru not only noted the academic development of the student, but also played his role in developing a perfect human being. The selection process was stringent wherein physical, mental and spiritual qualities of the student were carefully scrutinized. Evidently they realized the importance of creating caring, compassionate, resilient and altruistic physicians for the benefit of society. It is critical to medical education to promote development of such ideal habits of thought, feeling and action so that students learn to manifest the qualities of a 'compassionate, communicative and socially responsible physician'.

In the present situation, these aspects of values have been ignored. Even policy makers have failed to identify the importance of such professional habits, and the curricula have failed to reflect them. Insufficient contact with positive role models has decreased awareness about such values, as has a lack of opportunity for students to reflect on and learn professionalism. Incorporating themes related to ethics and professional standards in the curriculum is an urgent need. Teachers should become role models on such issues and encourage empathy and concern for patients to reinforce development of professional values. There can be sessions wherein Ayurvedic professionals could share with students their real-life experiences as to their leadership in clinical practice. The final assessment of students should include professionalism and attitudes that form essential traits of any health professional.

Perspectives for the future: sketch for a vaidya-scientist

Training young Ayurveda teachers as vaidya-scientists to work as agents of change is an urgent need. Vaidya-scientists need rigorous training in the Shastras, science and medicine along with exposure to appropriate research methodology. With more than 700,000 vaidyas, clinical research in Ayurveda offers an excellent opportunity for new knowledge and bedside observations. Emphasis on clinical research has to be broad-based. Rather than the narrow application of medical statistics, based on probability theory, we have to explore other modes of validity. Ayurveda laid great emphasis on consensual validity amongst experts. The experts who founded and advanced Ayurveda were called Aptas, which implied 'niharajas tamaha' (adepts who had no bias and were self-realized souls). This consensus approach is different from agreement amongst so-called authorities, who often express their views based on personal experience and bias. Presently, it is a practice at many scientific societies and bodies to call for consensus conferences to evolve a majority agreement for interventions when peers disagree³⁶. We have to reactivate the 'apta tadvidya sambhasha' (an intellectual dialogue among experts similar to consensus

conferences) on selected challenging areas. The congruent mode of validity will address Ayurvedic as well as biological evidence based on plausibility in *in vitro* and *in vivo* experimental models of a disease or the target features. Finally, the concurrent validity in humans would utilize new approaches like Ayurvedic pharmacoepidemiology, reverse pharmacology and systems Ayurveda (Figure 1)⁹. This approach promises to address the urgent need for translational research in Ayurveda³⁷.

We need young teachers to understand and convey the importance of rich concepts like *samsodhana karma*, *panchakarma* and other concepts like *rasa*, *guna*, *virya*, *vipaka*, *prabhava*, *dosha*, *dhatu*, *bala*, *agni*, *ama*, *srotas*, *rasayana*, *ojas*, to more profound ones like *tanmatra*. Also ways of converting these into suitable experiments in humans and model organisms, which are consistent with the philosophy of Ayurveda and Vedic knowledge to reveal the tissue, cellular and sub-cellular descriptors.

In recent years, Ayurveda, being at the centre of global attraction, is seen by health scientists as a new hope for health care. We observe an increased acceptance of scientific papers, increased number of patents filed and increased cross-specialty collaborations in Ayurveda³⁸. To meet these challenges and the growing expectations, we need to create highly motivated knowledgeable human resource in Ayurveda. As a first step, it is important to empower young teachers and researchers from Ayurveda colleges and institutions. A rigorous training programme is needed to carefully select faculty who have already demonstrated a high level of scholarship, innovation and research potential. These vaidya-scientists can become

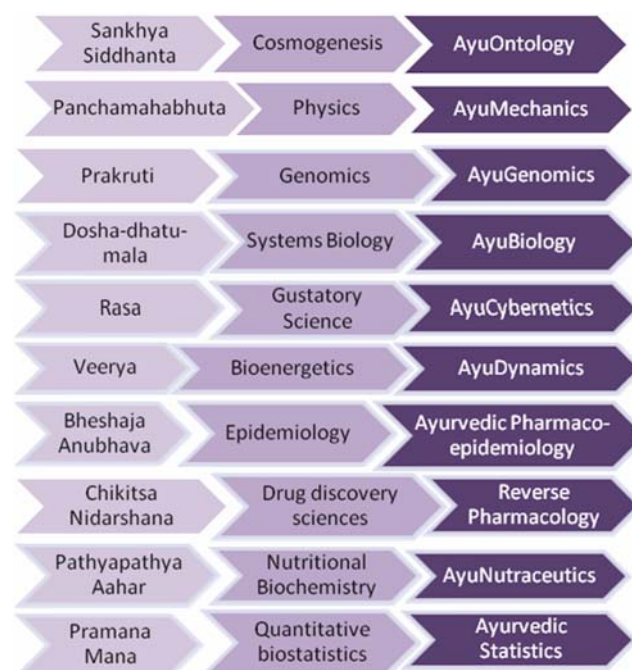


Figure 1. Recently explored correlation of Ayurveda and modern science through bridge disciplines.

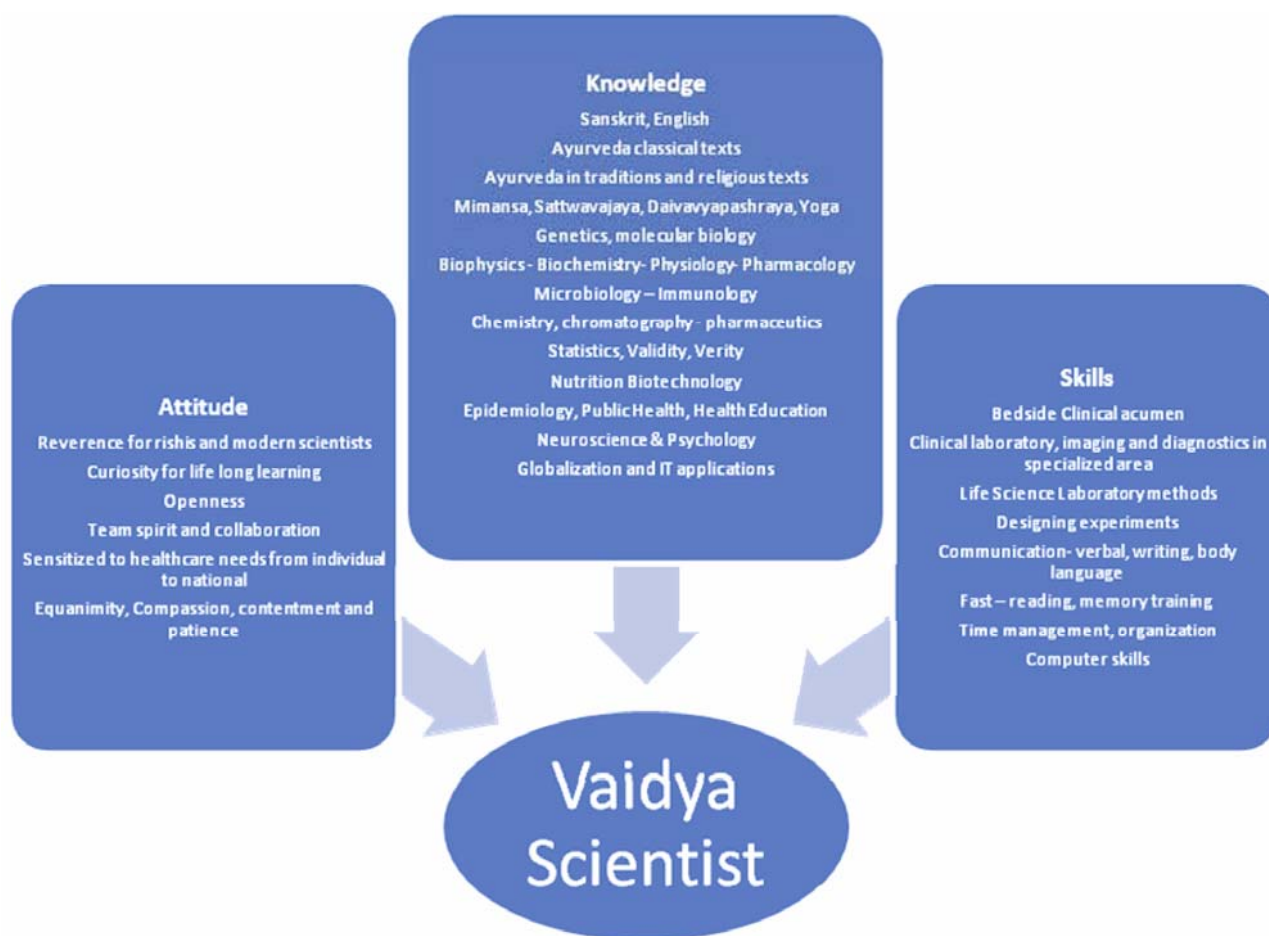


Figure 2. Requisite attitude, skills and knowledge for a vaidya-scientist.

agents of change and ambassadors of Ayurveda, who would carry forward the great legacy. The vaidya-scientists need to be mentored by the best available scholars and professionals of Shastra and science. Development of appropriate knowledge, attitudes and skills will be vital (Figure 2). Deeper understanding of *Brihatrayi* and exposure to contemporary commentaries as available in a series of legacy of Charaka, Sushruta and Vagbhata will also be important³⁹⁻⁴¹. This would help the vaidya-scientists to get acquainted with the current status of bridge disciplines. Thus, if we are able to carefully select and train a reasonable number of vaidya-scientists as agents of change, they will be able to assume such leadership in future. These ambassadors of Ayurveda can certainly initiate the much awaited renaissance in this system of medicine⁴².

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ACKNOWLEDGEMENT. We thank Drs Madan Thangavelu, Alex Hankey, Shashi Kiran, Aditi Bana, G. G. Gangadharan and Darshan Shankar for valuable inputs.

Received 17 November 2010; revised accepted 25 January 2011