Systems approach in medical education: The thesis, antithesis, and synthesis

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Abstract

Systems approach is a time tested, method of trying to understand the reality holistically, and resolving the issues by problem-solving method. It has resulted in enormous applications in almost every field of knowledge, science, technology, industries, agriculture, and health or education. The main essence of systems thinking lies in minimizing the inputs, optimizing the process to maximize the outputs through continuous feedback, and monitoring. Medical education has been greatly benefitted as the systems approach has influenced all aspects, from delineating the competencies of doctors, designing curriculum that includes comprehensive assessment. However, of late, there has been a debate as to whether the systems approach can really contribute to resolve complex issues such as bringing curricular reforms, or promote policy changes in patient care, education, or research. This involves a paradigm shift from problem-solving approach to "pattern recognition" and adaptive action to correct the system. This review based on critical appreciation, begins with a thesis that systems approach is a great tool. It then exposes its inadequacy to address complex systems. This is antithesis. In the end, a synthesis of both the contradictory views has been proposed as a take home.

Keywords: Complex systems, medical education, systems approach

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understood, hence referred to as black box. Human body, for example, receives food, water, and oxygen, which are processed through various biochemical processes such as respiration, digestion, blood circulation, and excretion ultimately leading to outputs such as energy, carbon dioxide, excreta, feces, and urine.

Another key concept in systems thinking is the distinction made between “open system” and “closed system.” An open system responds dynamically to the external environment through a feedback loop, which helps in monitoring and self-regulation whereas, a closed system is closed to the external milieu. Diwali rocket is an example of closed system. Open systems are preferred in all situations where in systems are expected to be responsive to the changes happening outside.

The early literature about systems thinking comes from the work of Dunlop, who applied it to explain industrial relationships.[2]

Manufacturing industries have been very successfully applying systems approach to their best advantage. This has helped them in achieving their dual objectives. The first objective is to be effective, in other words, to produce something “fit for the purpose.” This refers to quality. The second objective is to be efficient, in producing the given product in a most efficient manner, in other words to produce the required quantity in less time and cost.

Application of systems approach in education is found in the literature. Both clinical application of systems approach and its application in teaching have been described.[3,4] The medical education is a functional entity which is expected to be responsive to the external environment. This environment consists of patients, public, and members of the civil society who are the “stakeholders” of medical education.

INPUT

The main inputs in medical education are students, who are expected to come out as medical graduates (output) with requisite competencies to go for higher education or practice. The quality of students admitted to medical colleges to a large extent influences the quality of graduate output.

The quality of faculty members recruited is yet another input that really matters. However, one cannot guarantee that a high quality of faculty necessarily leads to the high quality of products. There are other inputs such as the infrastructure, resources, and facilities which are instrumental in enhancing the quantity and quality of output. Last but not the least the curriculum adopted by the medical college plays a key role in deciding the fitness of the graduate output.

PROCESS

Medical education system undergoes several processes, as the inputs (students) roll out as outputs (doctors). Most importantly, the teaching processes take place in a variety of settings such as class room teaching, laboratory work, library, Out Patient Department, bedside, clinics, field postings, and workplaces. Teaching is accompanied by monitoring and evaluation including several forms of formative and summative assessment. Another key process is the provision of feedback and mentoring provided by the faculty on and off the campus.

OUTPUT

The major output produced in the medical education system is a medical graduate, endowed with knowledge, skills, and attitude to serve the patients. There are other outputs such as service rendered to the patients, research output, and service rendered to the society.

While translating this into a working model, the steps involved are:

1. Identify stakeholders’ needs. Your products (graduates) should ultimately fit in with the needs of the society
2. Define the competencies expected at the end of a program and prepare a plan of evaluation including student assessment
3. Identify and engage inputs such as right students, faculty, infrastructure, and resources as required to achieve the program outcomes
4. Optimize the process of teaching-learning, monitoring progress by appropriate feedback mechanism including coaching, mentoring, and supporting.

The systems approach is, therefore, a great tool to systematize the entire process of education right from defining the product to design curriculum and develop assessment strategies for the students.[3] The beauty of systems approach lies in the fact that you can identify and specify the kind of product you need, and try your best by optimizing your inputs and the process. If you are keen to produce a doctor of international standard, you can do so by following systems approach. You need to engage the high quality of inputs, namely admit students of high merit, appoint faculty of high caliber, and invest in high-quality infrastructure and resources. You also need to optimize your process components, such as teaching, assessment,
feedback, and mentoring systems. In the end, you are sure to achieve your goal.

Let’s say that you are not be able to exercise control over the quality of student input due to centralized admission procedure National Eligibility and Entrance Test (NEET) or reservation policy of the Government. What you can do to achieve your goal is to accelerate your input by appointing exceptionally trained faculty, or to set in place a system of mentoring which can boost the performance of “weak” students to bring on par with “normal” students.

The main plank of systems approach is to attack the problem systematically. Problem-solving is the panacea. What is the problem? Where lies the problem? How can we fix the problem? Which solution works better? These are the questions used in systems approach to guide the decision makers.

Systems approach is also a time tested approach used in scientific and biomedical research. The steps which are customized here are: identifying the problem, the variables (outcome, dependent, and intervening), defining the hypothesis or research questions, describing a phenomenon (descriptive study), explaining, comparing or at times, predicting the pathway of the intervention (experimental studies), all of which leading to solve a problem.\[7\] The inputs here the researcher, the known literature in the field, resources, facilities, and time at the disposal of researcher. The process is the scientific method followed in the research. The main output of this system is “well-informed research scholar” who has generated a new knowledge or reconfirmed the existing information. Besides, there are other byproducts such as the evolution of a new procedure, product, or innovation benefitting the research community, in particular, and humankind in general.

Patient care, the third dimension of medicine is also a major beneficiary of systems thinking. A clinician is all the time involved in solving patient’s problem by following the time tested method of diagnosis. A person with a disease or deformity is the “input” who is successfully converted in to- “cured, healthy person,” the main output of the system. This is done by a “process” consisting of history, physical examination, diagnostics, treatment, and follow-up. Of course, there are other outputs accruing to society as a by-product of this system. The modern medicine, owing to the pace of specialization has resulted in too much compartmentalization, thus diluting the holistic feature of the system. Whereas, the Indian system of medicine is a typical example of a systems approach with a holistic approach to the diagnostics and treatment of the patient.\[8\]

Systems approach is, therefore, a well-known, well-tested strategy. It will address the problem as a whole, break the “silos” among various departments and direct them to work in harmony. The practical implications are that the leaders should be sensitized to this approach, work out a coordinated plan to find fault, and correct the same.

**ANTITHESIS**

While systems approach has contributed immensely to the advancement of patient care, education and research, there has been recent debate as to whether this approach still holds good in the current scenario of medical education. The current scenario is marked by the presence of “Complex Systems” which are too difficult to deal with, using systems approach. What we really encounter in complex systems are not the problems but the patterns. Stewart Mennin a thought leader in dealing with complex systems calls these issues as “sticky issues in medical education.”\[9\] Sticky issues are those which are not easily amenable for control. They are described by various individuals or groups, in various forms depending on what they “perceive” as truth and nothing beyond. The issue of enhancing quality in education, introducing curricular reforms, overcoming resistance to change are some examples of sticky issues which involve several stakeholders who do not agree about the nature of the problem or the solution.

For instance, everyone thinks that the medical profession today is undergoing erosion in professionalism. However, if you ask the various stakeholders, the students, teachers, professionals, and patients as to what they mean by professionalism, they will come out with different issues, with certain patterns.\[10\] For a medical student who has invested huge money on education, successful professional may mean a specialist who has a well-established practice in a high tech environment. For a patient, it may mean a doctor who is caring, compassionate, and cost-effective in treating. For a faculty member, it may mean providing the highest quality of care in compliance with high ethical standard. Thus, in the absence of a consensus on what is “real problem,” how can one solve it? Hence, the dictum is “Do not try to solve the problem but create a supportive milieu in which people are empowered to tackle the “problem” and move forward”.

**PARADIGM SHIFT IN THINKING**

The approach to deal with the complex systems, therefore, demands a paradigm shift in our thinking. We should
not waste our efforts in finding who is right and who is wrong. The first step is to ask WHAT. What is happening here? What is the perception of various stakeholders? For achieving this, we need to break the silos, consult and listen to every section without any prejudice. The traditional approach of relying on expert views will not work in case of complex systems. This will also dissolve the boundaries between the authorities and implementers, which is a big barrier for change management.

The next step after “asking what” is asking “SO, WHAT.” This is a state of reflection to seek what the issue means to YOU so that YOU can change. This leads to contemplation and adaptive action from your end to address the issue differently. This may involve several strategies which can be thought of as short and long term measures. For example, your approach to address professionalism could be to serve as a role model or rely on hidden curriculum which you could sphere-head on your own without bothering about system change.

The third and the final step is asking “NOW WHAT,” to freeze a particular adaptive action as a top priority for the time being. At the end, you would realize that the things would fall in their place not because of the “control” you choose to exercise in the systems approach, but because of your power to sit back, meditate, and do what best you can under the current of wavering pressures and pulls from various quarters. No doubt this approach requires a lot of dispassionate attitudes, and surrender of ego which are difficult to achieve. However, spiritual development can be helpful. Many leaders who made a difference to the society designed their own methods of dealing with the complex systems by the power of motivation, setting role models, and letting the followers to grow.

SYNTHESIS

Systems approach has no doubt contributed to the growth of mankind in all fields. However, as we stand on the pedestal of a society in which various ideologies, views, and practices are in conflict with each other, we need to move out of the box to address complex systems. Problem-solving strategy which is time tested method may be supplemented with pattern resolution strategy. This will mean that academic leaders should be willing to adopt a different leadership style with more of collaboration and less of competition, more of delegation and less of centralization, more of learning and less of teaching, and more of inclusiveness and less of exclusiveness in a spirit of giving for the collective good.

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