REVIEW ARTICLE

Reform in medical education system as reskinning: Dermatosemiotics as a paradigm

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Abstract

Contemporary medicine and health care suffered from ethical crisis. Medical profession is grounded in ethics, while medical education is grounded in ethics-free modern science. We need a graduate doctor who will approach the patients as a whole, as a person rather than reducing them into their diseased parts as if they are a machine. I used the term "skin", as symbolic boundary, to stand for the empathic attitude and professional identity which is symbolically constructed through the journey of medical education. The aim of the study is to use skin as a new language to create a new mode of thinking, that is, reframing the way we define health and learning to ensure leading sustainable reforms. Reform is changing the form, the shape of the system, this is best expressed metaphorically as reskinning. The professional identity of future doctors function like a skin, boundary, that define what is relevant and meaningful . Modern medicine uses machine as a metaphor to design modern medicine and education system. The skin of modern science is solid, thick, insensitive to the affective domain of the learning system reducing the outcome into disciplinary knowledge and skills. Changing this skin, is called reskinning, by inducing paradigm shift from machine thinking to relational system thinking.

Modern science gives the primacy for disembodied, detached observation to ensure approaching patients as independent objects. This detached stance of modern doctors led to the dehumanized approach and consequently commercialization of medical education and health care services. The profession has become less trusted and less respected by people. This study revealed that the origin of this ethical-professional crisis is rooted in Cartesian dualistic philosophy that separated subjectivity\the mind from objectivity \the body, that is, the Being from Having, and consequently graduating medical students Having the knowledge and skills of doctors but not Being a doctor. The cure of this crisis introduced by two philosophers, Mulla Sadra and Edmund Husserl who gave the primacy for lived experience and relational system thinking, that is, ethics.

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Introduction

Modern science and all its related extension in health, education, politics and economic adopted the model of machine system to ensure predictability, certainty and generalization.[1] Medical education system still working inside the paradigm \skin of modern science and this is what made them insensitive to the affective domain of both the students and patients. It made them come in touch with the quantitative dimension of the students and consequently the patients and forgetting their qualitative one, that is, their lifeworld, or personalized life.[2] This explains the reasons why the medical education system focused on the disciplinary knowledge and clinical skills, as they are objectively measured and assessed, while overlooking the affective domain as it is subjective and cannot be quantified.[3] This is where medical education system went wrong.[1] To lead the medical or health system on the right path , we need to go back to the root of the crisis , the Cartesian dualistic ontology that divides human beings into two independent substances (Res extensa and res cogitans).[3,4] In this study we introduced the solutions which are offered by two philosophers. The first one is the Iranian great philosopher Mulla Sadra (1572- 1640) who was contemporary to Descartes (1596- 1650), and the second one is Edmund Husserl who gives primacy for lived experience which is irreducible to categories of mind and body. Husserl viewed mind and life as an embodied intentionality that make embodiment the new language of philosophy of mind and resisting the dominant view of modern science that adopted disembodied discourse to ensure value-free, context-free knowledge. Dualisms of mind and body is possible only theoretically.[2,5]

Mulla Sadra (1571-1636) is one of the most significant Islamic philosophers after Avicenna. He was later given the title of Sadr al-Muta'allihin (Master of the theosists) for his approach to philosophy that combined theology and mystical intuition. He regarded philosophy as spiritual exercises and a pursuit of transcendence whose goal was to acquire wisdom. He led a radical philosophical reform that transcend the dichotomy between a discursive mode

of reasoning and knowing, and an intuitive, poetic and non-propositional mode of knowledge.[6,7] Hence, Mulla Sadra introduced a process -relational ontological stance that views life as unity in diversity in which everything is connected to everything, that is, a whole and part of whole as he clearly says:[7]

"All existence from its highest to the lowest and from its lowest to the highest is [united] in a single relationship by which some parts of it are related to some others. Everything is united in spite of their external diversity."

Mulla Sadra in this statement summarized complexity science and system thinking where the relation -as continuous motion \ communication — is a substantial feature of being rather than an arbitrary one.[8] Life, health, learning and meaning are an emergent phenomenon, resulting from this substantial motion. This study translated Mulla Sadra's primacy of being into the language of complexity science and phenomenology of touch.[8,9] Thus, the primacy of being is a primacy of relations, that is, ethics. This relational-ethical ontological stance can be used as a radical cure of the crisis in modern science that was created by Descartes dualistic ontological stance.[10,11]

The second philosopher who offered a similar radical cure of Cartesian dualism was Edmund Husserl who viewed mind as intentional mode of being which is ontologically in touch with something. This intrinsic intentionality makes us inside a world, inside a skin that define a horizon of what is possible and impossible. Understanding mind \consciousness as embodied intentionality is a radical break with the traditional western modern philosophy and science.[5,12] Mind as embodied intentionality is an antidote against dualism and detachment. Cartesian dualism is possible only in theory. Husserl gives the primacy for touch, the lived experience rather than vision with its need for distance and detachment. The lifeworld, the world of practice and feeling\touch is a foundation for scientific, mathematical, symbolic world. Edmund Husserl introduced the concept of the lifeworld in his Masterpiece, The Crisis of European Sciences and Transcendental Phenomenology (1936):[13]

In whatever way we may be conscious of the world as a universal horizon, as coherent universe of existing objects, we, each "I-the-man" and all of us together, belong to the world as living with one another; and the world is our world, valid for our consciousness as existing precisely through this 'living together.' We, as living in wakeful world-consciousness, are constantly active on the basis of our passive having of the world. Obviously, this is true not only for me, the individual ego; rather we, in living together, have the world pre-given in this together, considering the world as world for all, pre-given with this ontic meaning. The we-subjectivity... [is] constantly functioning.

Against these two views of the two great philosophers, we introduced dermatosemiotics as integration of the work of them to provide new boundary\skin for the education and health system that gives primacy for the empathy \touch, the whole rather than the detached stance that make us fragment this whole into different parts, body, mind and heart as if we are solid machines. The aim of this study is to lead a reform from Newtonian-Cartesians medical education system to the Quantum-Sadraian one. Using System thinking approach revealed that the root cause is a philosophical framework (paradigm), created by René Descartes through his Dualistic Philosophy. Most of the reform overlook this philosophical root and give the full attention to the symptoms of the crisis.[2]

Today medical education system still works inside the boundary \the skin of modern science, has made them insensitive to the spiritual and ethical dimension of life and human beings. The skin of modern science is dead, value-free, embracing a machine system model that reduces the function of medical education to provision of biomedical knowledge and clinical skills overlooking the affective domains that enable doctors to be aware of the psychosocial dimension of patient and learners. The outcome of such machine system is a doctor using only his eyes \observation to ensure objectivity and detachment reducing the patients into their biological system. This reductive view of human being, life and health is the skin of modern medicine which needs to be replaced by a new skin, a new paradigm that can touch the patient as a person, as a whole complex in a complex adaptive system. Thus, reskinning is a call for reframing medical education system using Mulla Sadra-Husserl ontological stance as a holistic view of life, health and learning to ensure fulfillment of reflective, competent doctors who view the patient as a whole or part of a whole, as system and subsystem and view themselves as part of the whole \profession.[14,15]

Medical education systems are facing capitalization of health and education resulting in deformity in the cultural identity of medicine and education as a service and moral enterprise. The commercialization and commodification trend of both medical education and health care system transformed doctors into a depersonalized machine, used by the capitalist system to sell health and education as a commodity. Physicians are no longer a role model for altruism, empathy and compassion, their identity \skin

became too hard to feel the spiritual dimensions of health and patients which can be touched only by those inside a soft skin and have a living heart. The root of crisis in modernity and modern science is bracketing the heart and feeling\ touch from the scientific system as they are regarded as a source for personalization and subjectivity.[16,17]

The failure of the most reform policies in medical education system and health care system is due to focusing on the parts of the system and overlooking the whole, the skin of the system which embodies the intentionality (mental model) of the system that gives form, shape and boundary to the system. Mental model functions as a skin that gives form and boundary to the medical education as social systems. In traditional education system, the skin of the system is extension to the skin of modern science which is hard and dead skin that comes in touch with the only physical dimension of reality. Adopting the machine mental model of modern science is the origin of crisis in education, health care system which is not present in these systems, it originates from the ontological stance of modern science which is known as substance or dualistic ontology which is developed by philosophers of enlightenment especially Descartes, Auguste Comte and Immanuel Kant.[3] The boundary\skin of Modern science defines what is inside as scientific and what is outside as pseudoscience. This boundary is permeable for only the measurable, value-free, a context-free, a subjectivity-free data to ensure certainty, objectivity and generalization.[3,4]

What is the Research Problem?

Take me apart and recombine me

Feature by feature and cell by cell.

Let some artist redesign me. Some mechanic realign me.

Each part young and shining and well.

Rotoroot my sticky plumbing,

Oil my joints till I leap with glee.

Brighten my eyes to see what's coming -

A brilliant new recombinant Me.[18]

For fragmentation is now very widespread, not only throughout society, but also in each individual; and this is leading to a kind of general confusion of the mind, which creates an endless series of problems and interferes with our clarity of perception so seriously as to prevent us from being able to solve most of them …. The notion that all these fragments are separately existent is evidently an illusion, and this illusion cannot do other than lead to endless conflict and confusion. David Bohm[18]

There are three challenges facing medical education systems in the 21st century:

1- Epidemiological challenge: There is an epidemiological shift from acute to chronic disease, where 63% of the 57 million global deaths in 2008 were due to chronic illnesses (principally cardiovascular and chronic respiratory diseases, diabetes and the cancers).[19]

2- Ontological challenge: Still Doctors approached patients using Cartesian substance ontology paradigm of modern science which separates the mind from the body as if they are independent substances. This dualistic ontological stance results in detached, fragmented practice which in turn leads to professional moral crisis. Modern medicine provided doctors with hard skin to ensure disembodied gaze and value free judgments. This explains why doctors use only their instrumental mind to diagnose and treat patients overlooking their emotional needs as empathy and communication. Doctors become blind to the patient's problems and life experiences and appear to be caring only for the physical signs that can be seen by their eyes and overlook what can touch their hearts. Hence, today's physician operates primarily as a mechanic or technician, whose clinical gaze is focused neither on the patient as a whole nor on the patient's context of life but exclusively on the diseased body or body part.[2]

3- Epistemological challenges: The shift from substance ontology to relational process ontology necessitate the shift from disembodied knowledge to contextualized one. Problem based learning as educational strategy is grounded in this newly emerged epistemology.[19]

The epistemological stance of modern science is still lived by 21st century doctors manifested as linear analytical thinking and thus, viewing the patients from their subspeciality only. To cope with the epistemological challenges of postmodernity and 21st century we need to shift our attention from the parts of the system to the relationship that unite these different parts into a complex adaptive system.[20]

Adopting complexity science as relational system thinking is the new skin that makes medical system inside the 21st century. The opposite of relational thinking is Linear causality thinking which is appropriate for machine system rather than the living system. Hence, we need to re-organize our concepts about pathogenesis and stop using the term idiopathic and replace it with complexity and emergence which give primacy for relations rather

than independent substances\agents.[21]

The phenomenology of reform

The success of any reform in any domain of life is the result of fulfillment of two conditions: internal and external conditions, subjective and objective, system and environment. These two conditions are connected semiotically at the biologically level and symbolically at the social level. The interface that connects them biologically at macro-level is known as a skin while it is called membrane at the microlevel. Language functions like skin that connects mind to social system. The term dermatosemiotics stands for this different level of organisation, interaction, interdependence that conditions the possibility of life, health and learning. Against such a background, I understand reform as intrinsic biological capacity embodied as adaptation and relearning in cognitive -behavioural system of the organism to the challenges of the environmental systems.[5]

Without this ability for reform and adaptation life will be unsustainable. Transforming a social system — like a medical education system — into living system, is the only condition that can make reform emerge as new skin, new mode of being, new identity that can cope with the 21st century environment.[8] Medical education systems are still wearing the skin of modern science which is machine skin, dead skin, making teachers and students detached from each other, competing with each other, indifferent to each other. As the consequence of being inside a modern science skin, the reform, change and learning can be achieved only through imposing external power, from external center that can move us from the state of inertia, the Newtonian law of inertia.[15]

Modern science adopted machine worldview of modern science \positivism which becomes a mental model controlling the designing process and management of the social systems, like education system, health care system and political systems.[22]

The unintended consequences of this machine paradigm were: atheism (value-free science), two world wars, imperialism, colonialism, capitalism, commodification of human being and their values, creating spiritual \ethical crisis which is still manifesting everywhere. This dehumanization process introduced by modern science is still functioning in our culture and social organization whether in the profit or non-profit ones. It functions as paradigm in use while personalized approach to medicine and education remains an espoused paradigm. The crisis will continue as long as we are still inside the skin of modern science, which is a dead skin, touched only by quantitative dimension of reality.[13,17] Only when we understand that the form of our traditional education system is still working inside a dead machine skin which is permeable for only one form of data, we can lead to the reform as reskinning. Thus, we can bring a change from machine system to living system, from a simple static context independent machine system to complex adaptive living system.[21] This commercial attitude towards medical students and patients is rooted in capitalism as economic extension of modern science which is embodied as political and social crisis and is bracketing the spiritual and moral dimension from the everyday practice and has kept it as theoretical discourse.[18] Hence, this moral blindness cannot be solved by adding humanities course or medical ethics module, it is a triple loop blindness, forgetting of the being and the human identity. Hence, the expected professional identity is aborted prenatally during medical education programme where everything done to the students is controlled by reward and punishment system and the power system rather than the love system which is embodied as caring, touch, communication and compassion. Money becomes the goal behind becoming a doctor and the competition today for specialties which can actualize this goal. Unfortunately, this is not only the goal of students but it is a collective phenomenon embodied in all domains of life. Having money is more important than being a professional or virtuous doctor. Virtue and morality became a commodity without market. Medical students and educators are transformed into "double agents", verbally inside the skin of the profession, religion and practically inside the skin of money. The solution is reskinning, at the level of systems rather than the persons and parts of the system. Edward Deming summarized this diagnosis by this saying:[23,24]

I should estimate that in my experience most troubles and most possibilities for improvement add up to the proportions something like this: 94% belongs to the system (responsibility of management), 6% special.

The new concept in this study which can facilitate sustainable reform is understanding the system as semiotic process that unified different parts and making them inside single skin\boundary, that is shared identity to fulfil a mental model.

Using skin as a metaphor and analogy for the paradigm or mental model — both the living system and socially constructed systems-rather than the machine metaphor is the threshold concept in this study, which I called Dermatosemiotics.[25] Metaphor is not merely a rhetorical device, characteristic of language alone, but rather a

fundamental feature of the human conceptual system. A metaphor is understood by finding an analogy mapping between two domains.[26] George Lakoff and Mark Johnsen in their outstanding book, they define our conceptual system as metaphorical in nature. They say:

"Conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature. The concepts that govern our thoughts are not just matters of the intellect. They also govern our everyday functioning, down to the most mundane details. Our concept's structure what we perceive, how we get around in the world, and how we relate to other people.[26] Using skin as metaphor of concept or mental model can help us understand how they function as a semiotic boundary that defines what is inside and outside and our allergic reaction to the excluded when they attempt enter the system. The biological function of skin as semiotic boundary is the basis for using it as metaphor for mental models, paradigm and as a threshold concepts that connect and distinguish the identity from others, the inside from outside, what is included and excluded. Skin as a semiotic communicative boundary is the basis for shift from hierarchy hierarchy, by its definition, has both an absolute top and bottom to holarchy. A holarchy is a connection between holons, where a holon is both a part and a whole.[27] The term "holon" was coined in Arthur Koestler's 1967 book The Ghost in the Machine.[28]

The outcome of adopting system thinking is a shift from the asymmetrical relation of I-I relationship to the dialogical I-Your relationship, politically speaking from democracy to holacracy.[29] Figure describes the complex adaptive system as dermatosemiotic paradigm:[8]

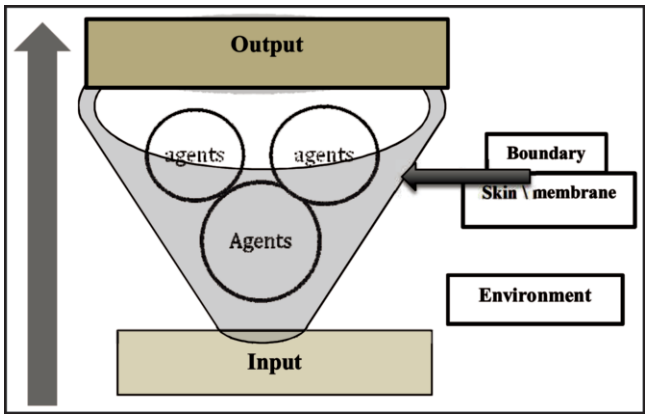

Figure: Complex adaptive system, composed of different agents interactive, interdependent unified by shared boundary \skin that connects them to external environment making it complex and adaptive, that is closed and open, self and other, identity and different. This diagrammatic representation can be used to understand all living systems, from cell to human beings.

What is complex adaptive system?

A complex adaptive system is a system in which a perfect understanding of the individual parts does not automatically convey a perfect understanding of the whole system's behaviour.[20] In complex adaptive systems, the whole is different qualitatively from its parts and more meaningful than just an aggregate of its parts.[8,11] The study of complex adaptive systems, a subset of nonlinear dynamical systems, is transdisciplinary and blends insights from the natural and social sciences to develop system thinking models that allow for heterogeneous agents, phase transition, and emergent behaviours. I need to share with you my understanding of the system which is grounded in Husserlian phenomenology which gives primacy for intentionality as the core part of the lived experience as shown in Table-1.[5,13]

A system is constituted by:[8]

• Collective intentionality \Purpose which stands for the whole, the output.

• Parts or elements interact together to fulfil this collective intentionality.

• Communication between the parts: (the processes and interrelationships which hold the parts together in view of the whole)

• Skin that functions as Boundary (the limit which determines what is inside and outside of a system).

We can express these basic principles of the systems thinking into this frequently quoted claim:

The whole is more than the sum of its parts, that the whole and parts co-determine each other resulting in emergence outcome which can be more or less than the sum of its parts depending on the type of relations that connect these parts, synergistically, competitively or antagonistically. Thus, systems are regarded as having four major characteristics as shown in Figure-1:[8,11]

1. Systems are goal oriented.

2. Systems have inputs from their environment.

3. System has semiotic process, information system, signaling system, translating input into output, perception into action. In living system, this semiotic processor is called cognitive system which is embodied in the all parts of the living system not just the brain.

4. Systems have outputs to achieve their goals

5. Feedback from the environment about the output that become input, to ensure self-determination, self-

Table-1: Difference between Machine linear systems and living non-linear systems.[9,12]

	Simple systems (Machine)	Complex adaptive Systems (Living system)
Number of states	Few possible states	
Connectivity	Connections between components are fixed	Components (agents) are dispersed and free to interact locally within a systemic structure
Behaviour (output of the system)	Input =output, that is, Predictable, certainty	Output is different from input. That is, Emergent behaviour and unpredictability\uncertainty\ Chaos
Nature of the system	Homogeneous	Heterogeneous
	Static	Dynamics
	Deterministic	Stochastic
	Non-adaptive boundary\artificial skin	Adaptive semiotic boundary\natural skin
Relation between input and output	Linear causality	Non-linear
	Top-bottom relation: reductionism	Bottom-up movement: Emergence
	Hierarchy	Holarchy

assessment, self-regulation and self-organization.

6. System boundary that makes self-reference and self-organization possible, without a boundary we cannot know where the self begins and where it ends.

If the parts of the system have a cognitive process with an intrinsic intentionality, that is, meaning making process (semiotic agency) working inside shared boundary, skin, that conditions the possibility for emergence of self-reference and autonomy, in such a case we can describe the system as complex adaptive system. Here, a comparison is made between the machine system and complex adaptive system which is essential for reform leaders:[21]

The threshold concept that differentiates machine system from living system is kind of system boundary, which can be either a living tactile interface that interacts semiotically with the external environment functioning like cognitive system, that is, brain or artificial machine boundary which responds to only predetermined semiotics (signal system). Living boundaries are learning boundaries, hence they make the system adaptive and evolving. The name of this tactile interface at the level of organism is skin and at the level of cell is membrane.[25] The emergence of life is impossible without the presence of such an intelligent surface and this explains the innovation in digital technology towards haptic technology using synthetic artificial skin. We can say that innate semiotics is the skin of the living system which makes interconnections intrinsically with the outside, interdependent and in communication mode. We cannot stop communication unless we are dead. This is what makes the living system complex and adaptive, the complexity is this intertwining achieved by this semiotic interface, the skin. Being inside a skin, natural or social skin, make us part of whole, belonging to a community, that is, having identity. The presence of dynamic relation skin makes our identity uncertain, unpredictable, emergence phenomena depending on the kind of skin we are inside at the moment of interaction. For example, wearing the skin of modern science as method make us in touch with only material dimension of the life condition the possibility for the emergence of atheistic identity, capitalistic identity, colonizing identity, dehumanizing identity.[1,2,15]

Mereology (from the Greek μερος, 'part') is the theory of parthood relations: of the relations of part to whole and the relations of part to part within a whole.[30]

Mereological relationship is outcome of being inside a boundary, physical and semiotic.

Skin used in this study as biological boundary that make mereology and semiosis possible.[25,31]

The term: dermatosemiotics, is coined to describe the mereological function of skin as a biological basis for semiosis.[25,32] Semiotic stance give primacy for relationship, communication rather than the solid parts of the system. It is an antidote against dualistic, linear, machine thinking that produces a glocal crisis in all fields of life. Dermatosemiotics is a new way of thinking that gives primacy for the skin as a relational interface that mediate connection between self and other, the subjective and objective.[9]

It is introduced here as a 21st century version of Mulla Sadra transcendent ontology and Husserlian phenomenology.[8,33] Dermatosemiotics is system thinking paradigm grounded philosophically into Transcendental phenomenology and scientifically into complexity science. In dermatosemiotics, complex adaptive system (CAS) are described as critical semiotic system.[25] Dermatosemiotics as an epistemological stance is critical systemic intervention at the level of the boundary \skin that embodies the mental model of the system having cybersemiotic function in controlling the input and output.[34]

Professional identity as complex adaptive system

Professional identity is an emergent phenomenon, resulting from interconnection, inter touch, interaction of four interdependent subsystems: ecological, social, biological, semiotic systems (cognitive).[8] The emergence of professional practice as an event and pattern is grounded in a systemic structure which embodies a system thinking as a mental model that views everything as connected to everything.[35] The new name for system thinking is dermatosemiotics. Understanding mental model as semiotic skin defining the boundary that decides what is inside and outside, what is self and other is the basis for the leading reform as reskinning. This is an intrinsic reform at the ontological level that redesigns systemic structure facilitating emergence of professional practice as pattern rather than just an accidental event. The energy that maintains a dynamic systemic structure is the new mental model that functions as living skin, making us in touch with life which is called dermatosemiotics, that is, the primacy of touch, primacy of relation, primacy of love which is rooted in Mulla Sadra's transcendent wisdom, Lifeworld phenomenology of Edmund Husserl and complexity of science.[8,36] Mulla Sadra's philosophy of primacy and unity of being is the threshold concept in cultivating a professional identity as triple loop reform at the level of being, that can cope with the complexity and uncertainty of the 21st century globalized heath care markets.[37,38]

The end of modern science and emergency of complexity science

In the prevailing medical model mind and body are essentially separated. Working from such a biomechanical model of human being, today's physician behaves primarily as a mechanic or technician, whose clinical gaze is focused on the diseased part of the body and overlooking their lifeworld, that is, lived experience.[2] The goal of modern medicine is reduced to the treatment of the diseased body — medical science rather the patient's wellbeing. There is no need for compassion and empathy as long as they are searching for physical cause that makes diseases happen.[2] Linear causality is the logic embodied by modern medicine which is not applicable only to the machine system.[1] Hence modern science gives the space for complexity science to complete its job inside the living system, that is, complex adaptive system, where linear thinking has resulted in wicked problems.[1,8,39]

Psychoneuroimmunology provides experimental findings like placebo phenomena, indicate that there is a semiotic interaction, meditated by language, non-verbal language, dermatosemiotics which is best embodied by new trends in phenomenology known as embodied phenomenology which tries to solve the dichotomy of the mind and body.[5,40]

The correlation between psychosocial variables and disease vulnerability, confirmed by psychophysiological studies that the patient's semiotic system (thoughts and feelings) embodied as biological phenomena affecting the choice of level of the intervention.[5,9]

Adopting Complexity science as dermatosemiotics science stance make us view life, health, learning, meaning as an emergent phenomenon, outcome of touch between different subsystems. The diagram below can be used to study and understand all living systems and their related social systems like medical education system and health care system, it is transdisciplinary skin\model that can ensure hospitality, commensurability, touch, communication and interdisciplinary space between the different disciplines converting them into a complex adaptive team, capable of solving the complex \wicked problems of the 21st century. The boundary between the modern science and complexity science is the living skin, which is excluded in modern science to ensure distance and objectivity resulting in disembodied observer and disembodied science, context free, and value free science. This explains why modern science went in the path of reductionism, reducing the complex phenomena into two substances, mental and physical, discarding the mental dimension and keeping only what is physical. The path of complexity science is the reverse, it starts from the interaction between the mental and physical which gives emergence to the whole complex phenomena. The primacy in modern sciences is the physical substance given to our eyes, while the primacy in complexity science is the semiosis, touch, the relation between these different interconnected worlds replacing the concept of reductionism which reduces the complex whole into elementary simple parts.[9,41]

Research paradigm

Paradigm is a mental frame which is guided by "a set of a mental model embodied as beliefs and attitude about the world and how it should be understood and studied."

A paradigm is a world view, a general perspective, a way of breaking down the complexity of the real world as shown in Table-2.[42]

Denzin and Lincoln listed three categories of those beliefs:[43]

• **Ontology:** what kind of being is the human being. Ontology deals with the question of what is real. Ontological stance functions as skin, boundary that determines possible epistemological stance, methodology and method. Hence,

Table-2: Comparison between modern science positivistic paradigm and complexity science phenomenological paradigm.[42-44]

Layers of the research paradigm	Positivism	Phenomenology
Ontological layer	Substance, Solid, concrete independent, One-dimensional	Relational-process, semiotic, interdependent stratified layers
Epistemological layer	Context-free, value -free knowledge. Observers are disembodied, detached	Contextualized, value-laden, the observer and observed are inseparable, complex system
Axiological layer	Absent	Present as precondition for doing science
Reasoning process	Deductive: linear thinking	Inductive: critical system thinking
Research design	Quantitative design: Experimental studies Surveys Cross-sectional, double blind controlled studies	Qualitative design: phenomenology, Hermeneutics Discourse analysis, ground theory, case study, action research, Ethnography Narrative analysis Thematic analysis
Method	Empirical observation and experimentation, statistical analysis, searching for statistical significance	Semi-structured interview, focus group, participants observation, searching for essential meanings, themes

ontological stance can be called the skin of the scientific research, everything else is just a body part.

• **Epistemology:** what is the relationship between the inquirer and the known: there are two kinds of relations: I-it relation which is embodied by quantitiave researcher, as they are detached from the subject of research and the second kind of relation is: I-you relationship which is embodied by qualitative researchers in which the separation between the researcher and the researched subject is impossible, they are in touch with each other and they become One. "Epistemology is the branch of philosophy that studies the nature of knowledge and the process by which knowledge is acquired and validated"

• **Methodology:** how do we know the world, or gain knowledge of it?

When challenging the assumptions underlying positivism, Lincoln and Guba also identified two more categories that will distinguish different paradigms, i.e., beliefs in causality and axiology.[43] The assumptions of causality assert the position of the nature and possibility of causal relationship; axiology deals with the issues about value. Specific assumptions about research include the role of value in research, how to avoid value from influencing research, and how best to use research products.[43]

Two major philosophical paradigms in the science inquiry are positivism and phenomenology.

The following is a contrast of the research approach that are entailed from these two different philosophical paradigms.[44,45]

Medical education system still guided by positivistic paradigm which functions as the system boundary, dead skin, dead heart that explains the failure of most reforms which are blind to the hidden agency of the paradigm in structuring our lifeworld and scientific practice.

We chose Mulla Sadra ontological stance as a phenomenological research paradigm to lead paradigm shift, skin shift from quantitiave medical education to a qualitative one which gives primacy for touch, complexity, interconnectivity, interdependence between the teacher and students, the doctor and the patients as they are both an agent in the education system and health care system who are responsible for the learning outcomes and health outcomes respectively.[8,35]

The choice of Mulla Sadra ontology as the skin defines what can be included as research methodology and method. This explain why the critical thinking system and semiotic analysis as methodology and method were selected. The best design that can fulfil all these different parts is action research which has a dual function: diagnosis and intervention.

Results

1- Ontological shift: from substance ontology to process ontology.

Substance ontological stance is the root of the crisis in modern science and its related extensions. It is the earth that gives solid foundation for binary analytical thinking, either\or thinking, separating the mind from body as two independent substances that produced a dualistic (education, medicine, economy, politics and religion). This explains why modern medicine adopted detached stance to focus only on the body and overlook the mind of the patients and their thoughts and feelings (the world 2 in Popperian ontology.[46]

The alternative position is going back to the living skin which connects the mind to the body into differential ontological stance that give primacy for touch, connection, synthesis rather than detachment, separation and analysis.[25,35] We can do analysis only when we are detached from life and become

disembodied. Analytical thinking is the outcome of substance ontological stance which is the result of ocular centrism which gives vision the supreme position in the hierarchy of senses.

Process ontology gives primacy for semiosis as meaning making process and translates the objects from different worlds to one another. Semiotic makes the three Popperian worlds function as subsystems in every human experience, that is, function as complex adaptive systems. Without semiosis there would be no communication between these different worlds. Semiotics function as skin that unite diversity into unity.

Dermatosemiotics in medical education embodied as practice-based learning, problem based learning and experiential learning. A primacy of practice, a primacy of relations, that is ethics, that ensures emergence of relational identity which is known as professional identity. In dermatosemiotic language, Mulla Sadra gives primacy for touch, the living body as constitutive of conceptual \propositional knowledge. While the traditional medical education system, had given the primacy for theoretical conceptual knowledge, that is, the detached, disembodied observer, as it is grounded in the oculocentric paradigm of modernity.

2- Epistemological shift: from objective knowledge to contextual \lifeword knowledge using complexity science as paradigm.

2- Shift from machine system model to relational living system, one which gives primacy for integration, relations, touch as starting point for learning and validation of past learning.

The consequence of this Onto-epistemological shifts is:

1- Leading reform at the level of mental model is lived as reskinning, going back to our living skin, resulting in a new way of being, a new identity that ensures sustainable reform and lifelong learning.[18]

2- Leading shift from andragogy to heutagogy (self-determined learning).[29]

3- Shift from competency to capability-based education (complexity science-based education).[11]

4- Leading shift from machine world medicine to lifeworld medicine.[13]

5- Leading shift from disciplinary doctors to transdisciplinary ones.[31]

6- Leading shift from centralization to decentralization (self-organization\autopoiesis).[5]

7- Leading shift from Newtonian organization to quantum organization (complex adaptive system).[11]

8- Using 21st century skills as framework to ensure sustainable reforms.[30]

9- Using the seven principles of complexity introduced by Edgar Morin to cultivate transdisciplinary\system thinking doctors.[31]

Discussion

Using dermatosemiotics as the new version of Husserlian phenomenology and Mulla Sadra primacy of working at the level of the mental model that functions as boundary \skin enveloping all domains of life.[8,13] The skin of modern medicine is extension of the modern science one which gives primacy for eyes, disembodied eyes, that is, detached observation to ensure objectivity and feeling-free approach to the world. Mental models is an ontological stance that define the boundary of the possible experience and action. Without changing the skin, that is, the mental models, we cannot expand the boundary of medical practice to include the patient lifeworld and their perspective as basis for decision making and care.[2] Mental models live as a relational being, relational identity, embodied biologically as skin that unites the touching subject with touched object, facilitates shifting from Cartesian substance ontology to Mulla Sadra process relational ontology. Mulla Sadra relational ontological stance is embodied by Edmund Husserl as transcendental phenomenology and in 21st century science as complexity science (system thinking).[8]

2- Systemic action research.[27]

3- Critical system thinking[27]

4- Learning organization[28]

5- Theory U as social technology lab.[26]

We need to define the questions required to be answered for induction of reflection and paradigm shift as reskinning. These are the suggested questions which can lead to a systemic change at the boundary level which defines the input, the process and output of the system. Below are the questions which can lead a systemic action research:

- What is paradigm \mental model?
- What is system? How many types of systems do you know?
- What is a metaphor? How does it determine our mode of living? And mode of scientific working.
- What are the threshold concepts in medicine?
- Can we use skin as metaphor for threshold concept? How?

• Can we understand learning outcomes as the skin of medical education system?

• Can we use semiotics to diagnose profession identity?

• What is the semiotics of life, health and learning?

• What is the semiotics of reform?

The aim of these questions is to disclose the mental models in use that control perception and action of the faculty and students towards each other and towards profession and patients. Using systemic action research as qualitative research method and systemic intervention to facilitate leading reforms at the level of mental models, can change the system boundaries that is, from Cartesian dualistic model of being to the Mulla Sadra unity. This change of model will ensure graduating doctors to use both eyes. One eye looks at the patients as whole and other one gazes at the body parts. Integration of both views will encourage critical system thinking which will make us lifelong researchers. This Dualistic binary thinking is the origin of crisis in medical education system which explains the reductionism of human beings into their body parts as if they are a machine creating linear disciplinary doctors who just use their eyes to diagnose and treat the patient's body and overlook the power of love and communication by touching the patient as a whole.

Dermatosemiotics as system thinking paradigm

Dermatosemiotics coined here is a process of ontological stance that gives primacy for meaning-making relations rather than for substances and detached objects. This ontological stance is embodied biologically as skin that functions as communicative boundary and phenomenologically as intentionality enacted as semiotics, that is, meaning-making activity. Dermatosemiotics describes this unity of being as a condition of our relational being at the level of the skin and semiotics connecting us to the whole in parts, the possible in the actual. Attitude, knowledge and skills are levels of beings rather than a separate domain which can be mastered independently. Mulla Sadra ontological stance bridges the gap between mind and body, knowing and being. To fulfil the intentionality of this ontological stance, we need to accept the complexity of perception as multimodality and embodied semiotic experience, which is irreducible to neither sensory data nor meanings which connected them into whole and part of whole, that is a complex adaptive system. Lived experience is a complex adaptive system which is best described using the ontological stance of Mulla Sadra and phenomenology of Edmund Husserl and system thinking of complexity science.[5,7,13,18]

In this study, all these stances are integrated into the unifying theme grounded in skin as semiotic tactile interface that can provide antidote against any binary thinking and reductionism of the whole into parts. This new paradigm is called dermatosemiotics which implies that we are connected to the physical world through the skin and the virtual symbolic world through signs (semiotics). Semiotics have been used as signs and function as skin that makes us in touch with the absent. Skin and signs are a communicative medium, that make intentionality embodied as non-verbal signifiers\ touch.[9,18,24] Without signs we cannot communicate, we cannot create shared reality and community of practice. Skin functions as a non-verbal communicative boundary, that defines what is included and what is excluded. To be a member, we need a membrane \skin. By defining the skin of the profession as touch rather observation, we shift the gravity of doctor-patient relationship from impersonal objective gaze to empathic holistic touch. By giving the primacy for being, practice as touch we make them embodied as a skin, system boundary that should be faced first to enter the medicine as profession. Skin gives shape and form for human body in addition to its perceptual and communicative function. To build a system, you need a system boundary that can simulate the function of skin to ensure sustainable adaptive system. Today, in the world of technology, skin becomes the target of haptic technology and artificial intelligence. We used the word skin as metaphor to stand for ontological stance, which defines what is real and enabling identification of the self from others and the inside from the outside. The function of ontological stance is an analogue of the skin which embodies the limit and boundary between what is touchable and tangible and what is virtual and symbolic.

Dermatosemiotic is thinking at the Mental model level

Mental models are signs, language system, metaphorical in nature that stand for external reality that people use to interact with the world around them. They are constructed by individuals based on their unique life experiences, perceptions, and understandings of the world. Mental models are used to reason and make decisions and can be the basis of individual behaviours. They provide the mechanism through which new information is filtered and stored. If a machine is used as a metaphor for life, and human function as mental model or paradigm for framing perception and action, how can we see things without a mental frame or a model. This is a neurocognitive claim which is confirmed by neurophenomenology and neurolinguistic. The tacit model that guides modern medicine and education is the same which is the machine

model that pervades not just academia but also colonizes our culture. It became a hidden paradigm that impedes any call for change and reforms, as it is seen as a call for disorder and uncertainty. The power of machine model is derived from its promise of predictability and certainty that every output there is a single input which can be discovered by scientific methods. Machine mental model views life as outcome of linear causality and hence it is a closed system independent of the context and value, which is nested inside it. Bracketing context and value systems are the origin of crisis which is unintended consequences of wearing the paradigm \model of modern science.

Medical education system still overlooks the threshold concept in medicine as a profession which is a professional identity. Traditional medical education system is extension of the modern science machine paradigm that views life and reality as substances, independent material objects that can be studied using as a linear causality and analytical thinking. The separation of subjectivity from objectivity is the root cause of crisis in medicine, education and politics. This dualistic ontological stance becomes a skin worn by modern science to ensure touching only as material part of being to ensure objectivity and certainty. This Dualistic philosophy associated with the thought of René Descartes (1596 - 1650), which holds that the mind is a nonphysical- and therefore, non-spatial — substance.[47] Descartes clearly identified the mind with consciousness and self-awareness and distinguished this from the brain as belonging to the material substance. Hence, he was the first to formulate the mind-body problem in the form in which it exists today.

Conclusion

The discourse of modern education is power discourse which give primacy for detachment, fragmentation, analytical thinking and control and overlooking the complexity of life and health that implies being in touch and uncertainty and chaos. The unity of knower and known is a taboo for modern science. Mulla Sadra phenomenology of perception as unity of being is the basis for leading a sustainable reform\reskinning that ensures graduating caring system doctors capable of dealing with the complex whole as uncertainty. The need of modern medicine for absolute certainty, objectivity and generalization is the reason behind adopting disembodied stance that gives primacy for eyes \observation rather than skin\feeling\empathy. Understanding the semiotic nature of perception as multimodality, feeling at its basis mediated by skin and observation at its top mediated by eyes is the main premise of dermatosemiotics which is validated by Mulla Sadra primacy of being and Husserlian phenomenology of perception as embodied intentionality. Human beings are living inside different worlds, physical world mediated by biological skin and symbolic world mediated by semiotic skin\language. Movement of living system is response to a need, challenge, perturbation at their physical, biological, psychological or social boundaries\skins. The focus of modern medicine on the body as a machine system, as if it is an independent entity is grounded in positisivitic philosophy created by the philosophers of enlightenment. The radical cure is introduced philosophically through two great philosophers, the first one is Mulla Sadra (1571-1636) who was contemporary to Descartes and the second one is Edmund Husserl (1859-1938). Mulla Sadra and Edmund Husserl share the same relational ontological stance that transcend any dualistic view of life that disconnects the knower from the known, subjectivity from objectivity, the values from facts, the mind from body. Their ontological stance is the basis for person-centred medicine, student centred medical education and narrative medicine that viewed human beings as symbolic species who live inside both biological skin and semiotic skin \language.

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