On Our Indigenous Abilities And Towards The Development Of Future Decisions: Revisiting Mathematics Education

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A lot of people and thinking centers are engaged in discussions about the concept, assessment, and building-up of creative minds. Between these people and centers, of course, one can find futurists, planners and scientific managers. Everybody is worried about the necessities of joining the era of "complexity" and "post-modernism or post industrialization" . It is now crucial to define the approaches to complexity and transdisciplinary thinking, and to adapt mathematics education to the fluidity of the emerging culture paving the way for newly coming problems and problem solutions of post-industrialization. For example, todays conference may change names and concerns from international conferencing about "Industrial Mathematics" to the revolutionary need, of information societies, simulation laboratories, and services leading economic sectors and activities.

In visualizing how to contact and benefit from today's "International Conference on Mathematics Education into the 21st Century", it is fruitful to discuss these matters with an interdisciplinary Central Team leading a prospective analysis for Egypt's alternative futures up to 2020. This team faces many challenges in designing Egypt's future; such as creativity concepts and social preconditions, and how to reach a system-increasing society (or avoiding a system-diminishing - overall returns). Also, in future studies approaches the team must search for solutions to reach transdiscplinarity, to come to non-prescribed solutions and ideas, and to set up the structurally different logical designs (qualitative and quantitative comprehensive simulation models) to foresee alternative futures. These borrowed details are internationally said for a guaranteed reasoning. Starting the 21st century these are the types of challenges which will face mathematics, logic, modeling, design, planning, scientific studies, forecasting, and decision-making. A first-hand conclusion now is to say that the future will require a good mathematics component in each individual and group (or enterprise) leader, as much as the need for good mathematicians. The future will raise a crucial problem about the existence or nonexistence of a mathematics media, as a specific media of the environment of information, science, and enlightenment.

As for myself, I graduated in 1962 as a mathematician from the Faculty of Science, then "shifted" directly - in those times full of Egyptian hopes - to the developmental planning career. In 1962 the proper term was to say "I "continued" my career" instead of saying "shifted". Sorry, I am looking now backwards. It took me decades to discover later how the reorientation of statistics, mathematics education, and quantitative modeling could empower ***creative*** thinking, ***multiple*** intelligence, and enlightenment thinking rather than the silly applied statistics averaging, econometrics, quantification, the misleading terms of objectiveness, … with which I started the "job" in the Institute of National Planning / Cairo. My hope is to find in the following pretensions, sayings, and essays some elements for the reorientation of mathematics education in the specified cultural identities and societal development stages. My hope is for you to record your experiences to fill some gaps when imagining a better future scenario for Egypt in education and childhood raising inspite of the much bigger "space" of globalization and the wilderness of economic competitiveness in which the winner is the one of "speedier" reactions. In general, it is an opportunity to share: experiences and concerns, confidence and validity, future problem solving, present values of future decision, intelligence, forecasting the future or doing it, … . But I shall try hard to touch, as directly as possible on mathematics education and its outer (external) gain.

Mathematics without alienation:

Before assuring that mathematics give tools for solving problems, one must take care that mathematics can, to a minimum extent, give tools to human communication. I know that both applications coincide, (solving problems, and communication) , but the complementary aspect between them is to a great extent neglected in many countries including Egypt. Some thing cultural and educational is very wrong. In the year 1994 - 1995 some frustrated students from the mathematics and computation department (The Faculty of Science) came to the Institute of National Planning for summer training. The ongoing discussions were about the life fields and job opportunities for mathematics applications. None were for them. Only the circle of ***teachers producing teachers.*** Nobody told them about the fields they have to ***struggle*** for; in strengthening society, sub-systems of communication developing information societies in national security, in rationalizing decision making on all levels, in technology transfer reverse engineering, in plant and animal evolution, etc… . Of course nobody also told them anything about differences in problem initiation and solving in different culture, or about intelligent gaming. This neglection led to captiveness of living in dichotomies and alienation.

I prefer here not to list some more points about the relation between models, thinking, intelligence, and even the concept of solving a problem itself on one hand and the Arabic Language on the other.(*)

Problems - oriented (!) mathematics:

Since when haven't we visited curriculum armed by the new coming features of speed, complexity, and competitiveness? Except for some comments published in "Scientific American" it seems that every thing in mathematics is O.K. We know that this is not the case, and we must teach this to the new cohorts entering the 21st century to make a bet.

I think the door should be opened for new minds and thinking for a new era, and not easily left peacefully living the appearance of industrialism and "Nation State" and modern governance (social order). Here the expected shaping towards new types will - never be exact or ***procedural*** - of creativity and intelligence.

Here, mathematics education can play a role in finding cultural and indigenous creativity capabilities. Mathematics curriculum will in this case link mathematics with simplicity and "the beautiful", instead of pulling students to the cyber "bold" state. It will educate through school media, and puzzles. H. Poincare and A. Einstein (maybe also, Mozart, and Goethe) spoke about beauty, simplicity and mathematical genius! If mathematics education would be able to integrate together peaceful "brain" respect human conscience and unconscience, educated guesses, and neural disintegration with compositional and concurrent thinking, we will really have what we call a new mind or new problem oriented mathematics. We all know biological, natural, and even social systems which did work. Why then does the available mathematics for these not always work at all? We must accept that something lies in mathematics and/or in mathematics education, which contradicts complexity and dynamics systems in which we are interested. There may be a fallacy in thinking one can model everything, that we fool ourselves by thinking of a solution not of successive solutions during moving and theorizing continuously, that we accept naively the idea - in setting indicators and aims for education and scientific thinking - of craving for relating parts to their wholes, as if it is allowed to fix "parts" and "wholes", or the mistakes that arise from setting complexity or holistic thinking as an equivalent to comprehensive approaches.

I mentioned all of these warnings only to say that the reoriented mathematics must cope with measurement,…) through the steps of solving, and not before. Flexible concepts, the measurements, that theory, and variables space. This approach is introduced now as

(*) And - of course - not to list also the problem of how creativity works, if it is independent of the verbal cognition and expressions, …

"complexity", (an era, and a way to solve problems and towards transdisciplines) - which still needs a lot in mathematics and mathematics education.

Discussing unsolved problems as a homogeneous part in the curriculum is wise advice. But, I repeat that the list mathematicians have in fact is very short when compared with the real one. Mathematics education must encourage the identification of the extra knowledge to be added in the different environments and cultures in order to reach an intelligent solution. And I still think that assessing the level of a mathematics student will take place outside the classroom without taking into consideration "justice" implications.

One of the most important features of this problem oriented mathematics education is to derive rules and train students on how to decompose complex systems keeping sufficient reintegration rules in mind, and to build your own software for information based complexity.

To end this, it is important to remember that this reorientation towards integrated problems will gather and integrate in the classroom practices much more than what we call till now "mathematics".

Mathematics for the emerging new world:

Our international conference can end with suggestions of good will about mass media, the group, applications, problem solving and research tasks, … and the benefit from mathematics education. But there is a big question mark. How can each of the above positively add to mathematics education? So the agenda that we ourselves believe in includes how can every one benefit and contribute to establishing an environment encouraging for mathematics education and its expected gains, …. We must continue working on such an agenda to prevent planning, design, politics, and economics, etc. … from becoming entangled in utopian schemes.

- To assure that globalization will not sweep the "other" cultures and axioms of logic and intelligence. Similarly to stop any type of conservative action against the enlightenment embodied in strengthening mathematics and scientific education.
- Mathematics education needs to over come the dualism of antagonistic culture, as well as to strengthen the dialectics of living together and the competing with different cultures.
- To settle some help for students who want to know more about the ***mutual*** relation between computers and mathematics education.
- Mathematics education must rely mainly on general lectures by very gifted personalities, self learning, world wide working together, … and last but not least on redesigned courses.
- Applications of domestic examples and special attractive introductions are not less valuable compared to the banking of bio-genetic characteristics, and so those examples must be gathered and accessed easily.
- Applications in social sciences must not wait for progress or suggestions coming from natural and biological sciences, as was the case historically. If the disciplines of mathematics for big numbers, simulating human behaviour, information-based complexity, data mining, … continue to benefit team work, this will lead to genuine modifications in mathematics and its education.
- Small-scale businesses and even future individuals need something like the concept of overall quality control in thinking mathematically, at least a minimal of build-in warnings.

- Mass media must warn of misusing (and/or abusing) mathematics, statistics, and quantitative models. In Egypt we are in real need of media, magazines, and scientifically well - developed editors and managers.
- As someone (unknown) said: theory is no theory at all, for by definition we must venture some prediction that will ultimately be put to the test of ***reality*** **.** In social sciences, as it is clear, the situation is miserable. Our minds must go beyond linearity, averaging, minimal least squares, to expanding our concepts of testing hypothesis to test the implications of successive iterations on social performance.
- In this approaching world we are facing when entering the 21st century, education is not a student + teacher + school. The school will be a part of a new community and internationally linked family, for a small venture dealing intensively with scientific knowledge. Education will be a goal + indicators + information integrating environment. This type of restructuring will need another concept for teachers building.
- There will be another way for reaching totally new algorithms and artificial intelligences. This is to start on the internet, allowing anybody to interact, propose and modify (according to some minimal rules of course).
- Good mathematics education in the future will need the interest of non-governmental organizations to guard against calling anything mathematics or mathematics education.
- We know that in social systems uncontrolled partial analysis is more than a miss. So there is a need to suggest ways for demonstrating multidimensional dynamics of social systems. Without such developments expert interface is much more difficult or impossible.
- People love football more than chess because of the uncertainty and group spirit attached to football matches. Applying mathematics in social and future applications - in mathematics education - can give it the joy of playing with fuzzy subsystem within a group spirit. Patternized solutions are not aimed at, accurate solutions are not claimed, our algorithms must not be of the type of cause and effect.

Request for urgent help

- Coming now to an end, the following are the fields for such expected crucial needs;
- Differential gaming with discrete variables in order to modify paradigms and theories ("without stop" - or on the move) - and decision making.
- A proper mathematical formulation in which "relative times" for a certain incident are products of the model solution.
- Designing a reverse engineering algorithn for software (legally) in order to investigate the hidden cultural and special interests.
- As far as the concepts of creativity and information media are changing, so must the assessment curves.

As far as complexity is an era, so the basics of applied statistics and sample design must be developed.

All mathematics, object design, symbol systems, of modeling for the very huge number of non-similar agents (as I spoke about the emerging world) must appear beautiful and simple. That is what will be needed from and for social sciences and human arts.

In social sciences (and maybe in bio-kingdoms) there are very important variables which need more mathematical work because of their different nature. Those are the variables of flow of information and scientific knowledge.

I hope I have already taken you in a tour in the minds of the Central Team members (working together with a Unit for Computation and Modeling), to see their worries about mathematics for the project Egypt 2020 methodology and about mathematics education for following generations. Thank you.