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PEDAGOGICAL: ACCOMPLISHMENTS AND GOALS

My Philosophy of Life

While there is a will there is a way

NO handwritten notes except original signatures.

VOID unless bears original signatures on every page.

DATE and TIME of printing must match on every page.

Summary — Realizing that investment in human-resource development is one of the most efficient and effective ways of elevating the standard of a society, philosophy, contents and pedagogical techniques in mathematics and related fields are devised to create a nation capable of putting forward arguments on the basis of numbers.

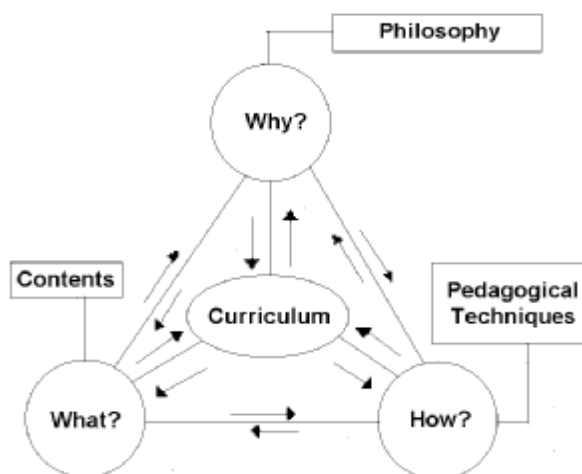


Fig. 1. Philosophy, contents and pedagogical techniques — their relationship with curriculum development (Mathematics Curriculum of HEC 2008)

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Philosophy To cultivate habits of creative thinking and critical analysis, by providing highly-motivated students sufficient depth as well as adequate breadth of the core and the related subjects, so that they can make informed, independent decisions, under stressful situations. To integrate the various aspects of curriculum development (why to teach – philosophy; what to teach – contents; how to teach – pedagogical techniques) in such way that the student is educated to become a *manager* of resources of the universe (not a *thief*) and shall know relationship with Allah, self and environment – philosophical basis (cf. Fig. 1). The contents should be developmentally appropriate, consistent with philosophy and have no conflict in terms of depth and breath of the topics taught (cf. Fig. 2 on page 36 of <http://www.ngds-ku.org/Papers/C70.pdf>). The pedagogical techniques should conform to cultural values and encourage student participation by including activities, which could be conducted in local environment.

Methodology *What to learn* is the main factor in TRAINING. A trained person “knows” the techniques, which can be repeated under standard situations. *How to learn* is the essence of EDUCATION. An educated person “knows”, “can explain” and “can apply” the concepts and the techniques. Emphasis is placed on concept building (through debates, discussion sessions, activities) and technique developing (smart approaches to problem solving, problem broken down into ‘data’, ‘objective’, ‘solvability’, ‘strategy’, ‘setting up of problem’, ‘solution’ and ‘result to proper significant figures’) Please click “Problem Solving” hyperlink on my homepage. A motivational session (comprising of historical evolution, applications and relationship to the students’ own discipline, in particular, and the society, in general) is conducted before start of every course. Students’ level is determined in the beginning (through pretest, life-history essay and discussions). A system of continuous feedback (to set pace and depth) in addition to end-of-term confidential evaluation is established. Each course is divided into one-week duration units. The mode of instruction consists of pre reading (before the start of unit) and pre quiz; lectures accompanied by activity and followed by tutorial and discussion/ problem-solving session; one-minute post lecture summary (by students and, afterwards, by the instructor), post reading, assignment of homework problems and post quiz (not all the described methods are applied in a single course).

Accomplishments Undergraduate Students (sophomore level) of University of Karachi having no background in problem solving were trained in a four-month period to solve problems from the PhD qualifying examinations of the top US institutions. Freshman-level students (who did not study mathematics beyond grade 10) were taught linear interpolation and extrapolation while reading and interpreting NCHS growth charts. Physics was integrated with mathematics, special emphasis given to conservation laws, with implications and applications in different branches of science and engineering. As Member of Expert Panel (Mathematics), National Curriculum Council, Ministry of Education, Government of Pakistan, I reviewed outline for Classes IX-XII Mathematics Curricula as well as developed and applied criteria for review of textbooks. This exercise has helped National Curriculum Review Committee (NCRC) for Mathematics, Higher Education Commission to interface BS curricula with pre-university curricula. As Convener of NCRC, which prepared 4-year BS, 2-year MS (MS to replace the existing MPhil Program) and 2-year PhD Programs during year 2005 for possible implementation in Pakistani institutions. The committee reviewed undergraduate mathematics curricula taught in the national institutions for content and pedagogical techniques, striking a proper balance between pure and applied mathematics. The programs have been revised again in year 2008.

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BS Program	Salient features of this program may be summarized as:
<i>Prioritization of Courses</i>	Must know (Foundation Courses) Should know (Major Courses) Nice to know (Electives)
<i>Depth and Breadth of Courses</i>	Given in terms of precedence graphs (flow charts) [depth: pre-requisites] and influence graphs [breadth: co-requisites], respectively
<i>Syllabus</i>	Course Supervisor is required to distribute syllabus breakdown into 14 units, each unit completed within a week.
<i>Pedagogical Techniques</i>	Lecture sessions of each unit (normally, 2-3 lectures) are followed by a tutorial session (reinforcing the concepts taught through examples, alternate derivations and proofs) as well as a problem-solving session (teaching skills of problem formulation, qualitative analysis and finding solutions), each of these sessions conducted, separately, by the Associate Instructor at the end of lecture session of every unit. In addition, a review session should be arranged prior to each monthly test (hourly) and a comprehensive review before the final examination, both sessions conducted by the Course Supervisor.
<i>Continuous-Evaluation Report</i>	Course Supervisor (Instructor) is required to prepare a progress report after each hourly mentioning tentative grade (cumulative grade based on all hourly, quizzes, problem sets and assignments taken to date) and attendance record (pilot tested at IBA and SZABIST). It may, also, include qualitative description of student's weaknesses and areas needing special attention. Laboratory and theory portions are separate passing heads. This report is discussed with the student as well as student's parents, if unsatisfactory.
MS [PhD] Program	Important features of these programs are listed below:
<i>Entrance Requirements</i>	For MS: BS (Mathematics) or equivalent; GRE (General); written test; personal interview For PhD: MS in Mathematics or equivalent; GRE (General) and GRE (Mathematics); personal interview
<i>Masters Examinations [PhD-Qualifying Examinations]</i>	Masters' Examinations (written + oral) must be passed before starting thesis research; any student, who fails to qualify these examinations in 2 attempts, or by the end of first year of study, is asked to withdraw from the program. Masters' Examinations are to be offered by the department 4 times during an academic year. Written examination may consist of selected questions from PhD-Qualifying Examination, testing the student in core areas. Oral examination, testing the student in the area of specialization, is scheduled only after the student passes the written examination. During the oral examination the student is, also, required to describe the proposed research work. Committees formed by Board of Advanced Studies and Research conduct these examinations. In order to help prepare the student for these examinations, the department shall offer non-credit courses Masters-Examination (PhD-Qualifying-Examination) Preparation during the first and the second semesters of graduate studies.
<i>Pedagogical Techniques</i>	Lecture sessions of each unit (normally, 2-3 lectures) are followed by a problem-discussion session (reinforcing the concepts taught through examples, alternate derivations and proofs, innovative solutions to the problems), conducted by the Associate Instructor. In addition, a review session should be arranged prior to each monthly test and a comprehensive review before the final examination, both sessions conducted by the Course Supervisor.
<i>Mathematics Undergraduate Teaching</i>	Student acts as Associate Instructor (Teaching Assistant) in a BS course. This is an opportunity for a student to gain teaching experience at the university level. Each course taught by the student earns a practical-experience credit and is graded according to at least two of the following evaluation criteria: <ul style="list-style-type: none"> a) Feedback from students b) Lecture/Tutorial/Problem-solving session observation by senior teachers c) Videotaped lecture/tutorial/problem-solving session evaluation by experts

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Honors Rated as best teacher in undergraduate and graduate courses taught at Hamdard Institute of Information Technology (1999) and SZABIST (2001); highest rating by experienced college teachers in the Six-Day-In-Service-Training Course conducted by HEC (2004); Chief Guest in the Sindh Educational Conference (2009). The titles given by students <<http://www.ngds-ku.org/kamal/titles.htm>> and their occasional comments <<http://www.ngds-ku.org/kamal/Skills.htm#Jalees>> reflect their immense regard and respect.

Goals Mathematics curricula need to be developed taking into account the breadth (reinforcing and building on the concepts and the techniques taught in other allied branches, say, physics, without duplicating) and the depth (preparing content-outline chart, containing the level, the concept, the activity/the experiment to reinforce this concept, the reference and the philosophy behind teaching this concept). Preliminary work has been done for pre-university curricula:

<http://www.ngds-ku.org/ngds_URL/subprojects.htm#Pre_University>

Foundation courses in mathematics should train students in the following disciplines:

- | | |
|-------------|------------------|
| a) Analysis | d) Mechanics |
| b) Algebra | e) Number Theory |
| c) Geometry | f) Topology |

In addition, the students should be taught methods of mathematical physics, statistical techniques, probability theory, measure theory, set theory and logic, modeling and simulation. The students should be able to see the bridge leading them from mathematics to technology passing through physics and engineering.

Educational Conference *National Workshop on Teaching of Physics*
Department of Physics, APWA Government College for Women, Karachi,
December 26-28, 1987 (Member, Organizing Committee)

Teachers' Trainings *The NGDS Workshop Series: Improving the Quality of Mathematics Education in Pakistan*
Beacon Light Academy, 'O' Levels, Karachi, August 12-26, 2009 (Master Trainer)
<http://www.ngds-ku.org/ngds_folder/Wrkshps2009.pdf>
Six-Day-In-Service-Training Course (Mathematics for College Teachers)
HEC Regional Office, Karachi, August 16-21, 2004 (Course Coördinator)
Correction Strategies at the Intermediate Level
Commecs Educational Trust, Karachi, April 17, 2004 (resource person for the module)
FDP Intensive Workshop
Commecs Institute of Business and Emerging Sciences, Karachi, 1999
(Subject Expert in Mathematics)
Science Teachers' Training
The International School, Clifton, Karachi, 1997 (Master Trainer)

Selected Talks *BS, MS and PhD Schemes of Studies Prepared by NCRC (HEC)*
Research Seminar, Department of Mathematics, University of Karachi,
September 2, 2006
How to Motivate the Students to Learn?
Seminar, the Aga Khan University, January 21, 1998
The Making of a Physicist
The Karachi Physics Society Seminar, FG Urdu Science College, Karachi, November 25,
1986

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- Selected Books** *Mathematics— Revised Curriculum (BS Scheme of Studies)*
KAMAL SA, Convener, National Curriculum Revision Committee in Mathematics, Higher Education Commission, Islamabad, Pakistan, 2008 [Editor] <<http://www.ngds-ku.org/hec/math-booklet-final-2008.pdf>> (no spaces in the address)
National Curriculum for General Mathematics— Grades XI-XII
KAMAL SA, Member, Expert Penal, National Curriculum Council, Ministry of Education, Government of Pakistan, Islamabad, Pakistan, 2008 [National Advisory Committee]
National Curriculum for General Mathematics— Grades IX-X
KAMAL SA, Member, Expert Penal, National Curriculum Council, Ministry of Education, Government of Pakistan, Islamabad, Pakistan, 2007 [National Advisory Committee]
National Curriculum for Mathematics— Grades I-XII
KAMAL SA, Member, Expert Penal, National Curriculum Council, Ministry of Education, Government of Pakistan, Islamabad, Pakistan, 2006 [National Advisory Committee]
Mathematics— Revised Curriculum (BS, MS and PhD Schemes of Studies)
KAMAL SA, Convener, National Curriculum Revision Committee in Mathematics, Higher Education Commission, Islamabad, Pakistan, 2005 [Editor] <<http://www.ngds-ku.org/hec/math-booklet-final-2005.pdf>> (no spaces in the address)
- Selected Papers** *Curbing Corruption in the Pre-University Education*
KAMAL SA, Seminar on Curbing Corruption in the Education Sector, the Education Committee, Transparency International Pakistan, Ambassador III, Hotel Marriott, Karachi, 2011, p 1 <<http://www.ngds-ku.org/pub/confabstA.htm#C86>>
Concept Building in the Undergraduate Mathematics and Physics Curricula
KAMAL SA, Siddiqui KA, Naseeruddin, Karachi University Journal of Science, 37(1&2), 2009, 1-6 <<http://www.ngds-ku.org/pub/jourabstA.htm#J28>>
Mathematics of Experimentation
KAMAL SA, National Conference on Physics and the World of Today, in memory of Prof. Dr. Muhammed Rafi and Prof. Dr. Muhammed Razi Hussain, Department of Physics, University of Karachi, 2009, abstract # 1, pp 9-10 (Prof. Dr. Muhammed Rafi and Prof. Dr. Muhammed Razi Hussain memorial lecture) <<http://www.ngds-ku.org/pub/confabst.htm#C77>>
Gauss' law: Choice of the Gaussian Surface and Form of the Electric-Field Vector
KAMAL SA, Workshop on Physics, Government College, Hyderabad, Sindh, Pakistan, 2009 (invited lecture) <<http://www.ngds-ku.org/pub/confabst.htm#C74>>
The Integrated Educational System: A Pre-University Educational System for the Third Millennium
KAMAL SA, the Sindh Educational Conference, the Jamia Millia Government College of Education, Karachi, Pakistan, 2009, p 1 (keynote lecture) <<http://www.ngds-ku.org/pub/confabst.htm#C73>> (no spaces in the address)
From Mathematics to Technology: A Bridge Through Physics and Engineering
KAMAL SA, Proceedings of the International Conference on Physics and the World of Today, Edited by Jafri MA, Naqvi SM, National Center for Physics and Department of Physics, University of Karachi, Karachi, Pakistan, 2008, pp 32-39e (invited paper) <<http://www.ngds-ku.org/pub/confabst.htm#C70>>
Vision of the Academic Community of Science and Physics Concepts at High School
Ara J, **KAMAL SA**, **Rahim T**, **Naseeruddin**, the International Conference on Physics for World and Society, Celebration of World Year of Physics and Third Annual Session of Rajasthan Physics Association, University of Rajasthan, Jaipur, India, 2005 <<http://www.ngds-ku.org/pub/confabst.htm#C65>> (no spaces in the address)

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- Selected Papers** *Mathematics Research and Teaching in University of Karachi: Challenges and Opportunities*
(continued) **KAMAL SA**, the Winter Conference in Mathematics, Center for Advanced Studies in Mathematics, Lahore University of Management Sciences (LUMS), Lahore, Pakistan, 2004, abstract # 24, p 18 <<http://www.ngds-ku.org/pub/confabst.htm#C62>:>
The Training of a Physicist: From Concept Building to Problem- Solving Skills (Concluding Talk + Recommendations of Conference)
KAMAL SA, the Second International Conference on Physics Education, Center of Physics Education, National Center for Physics & Department of Physics, University Karachi, 2003 <<http://www.ngds-ku.org/pub/confabst.htm#C57>:>
Basic Requirements to Train a Physicist
KAMAL SA, Siddiqui KA, Physics Education (India), April-June 1989, pp 53-61 <<http://www.ngds-ku.org/pub/jourabst1.htm#J10>:> (no spaces in the address)
A Survey of School and Pre-University Physics Education in Pakistan
 Siddiqui KA, **KAMAL SA**, in Physics Education in Asia (Proceedings of the Regional Physics Education Symposium and the Aspen General Conference, 1986), Edited by Aidid SB, Ismail MZ, Koh AK, Singh MM, Kuala Lumpur, Malaysia, 1987, pp 81- 89 <<http://www.ngds-ku.org/pub/confabst1.htm#C28>:>
How to Develop Creative Thinking and Critical Analysis?
KAMAL SA, Siddiqui KA, Proceedings of the Second Workshop on Teaching of Physics, Edited by Hasnain AF, Karachi, Pakistan, 1986, pp 51-56 <<http://www.ngds-ku.org/pub/confabst1.htm#C24>:> (no spaces in the address)
Physics Makes the Deaf and the Dumb Equations of Mathematics to Speak
 Siddiqui KA, **KAMAL SA**, Proceedings of the Second Workshop on Teaching of Physics, Edited by Hasnain AF, Karachi, Pakistan, 1986, pp 40-49 <<http://www.ngds-ku.org/pub/confabst1.htm#C25>:> (no spaces in the address)

If you want to secure your nation for 100 years, then develop good weapons, but you want to secure your nation for 1000 years, then develop knowledgeable people.

OLD CHINESE SAYING

Web address of this statement: <http://www.ngds-ku.org/goals/Univped.pdf>

HTML version of this statement: http://www.ngds-ku.org/goals/pedagogical_syn.htm

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