RESEARCH: MAIN GOAL AT TERTIARY LEVEL

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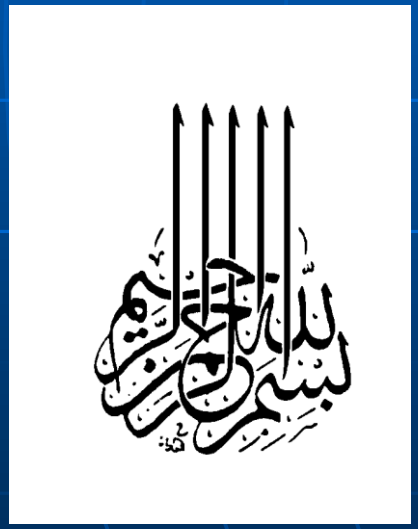


Assalamu A'laikum

SCIENCE & MUSLIM PLIGHT

- Describing scientific productivity in the 57 countries of OIC as abysmal is perhaps an understatement. More than 1.5 b Muslims living across the Islamic world — a quarter of the world's population — generate a little over 1% of the world's scientific literature & have produced only two scientific Nobel Prize winners.
- Some often attribute this malaise to a host of cultural, religious & historical factors. But this misses an important element: the absence of quality institutions & incentives for science in the Islamic world.

Research – Why?

- Muslim countries have mostly **inadequate system of education** – this is particularly so in the **tertiary level in all disciplines**.
- **Research & research output** in terms of publication & patents are negligible in many of the Muslim countries including Bangladesh.

The Impact of New Technologies

- The challenges to the Muslim have become even more acute with the emergence of new technologies (micro-electronics, biotech. & materials). Their rapid diffusion through the creation of new products, processes & services is aggravating the "economic equation" between the developed & developing countries - the consumers of technology.
- The Islamic countries are by & large at the receiving end – thus rapidly losing traditional comparative advantage which resided in the availability of natural resources & cheap labour. The new technologies are both resource saving & performance enhancing. This, coupled with trade universalization & investment worldwide, has increased competitive pressures.
- Thus the change is pervasive. It calls for the preparation of a pragmatic strategy by the Islamic countries, individually & collectively, for the dev. of S&T in tandem with economic dev.

- **Research, particularly scientific research generates wealth.**
- **Need to catch up with the rest of the world or lag behind economically, socially and politically.**

A brief account of the state of affairs in the field of research in S&T is given (true for Business, Economics, Sociology, Humanities, etc.)

Science Deficits

- **An OIC study**

  Total scientific output of member countries using Thomson Scientific's Web of Sci. database (holds ~ 8,700 Res. Journals, Monographs & Conf. Proc.

  Turkey leading (see Table 1).

Contries	No. Publ. (1995-2004)	Publ. Per million (rank)	Growth rate*
Turkey	82,407	116.5 (4)	82.3
Egypt	27,723	38.9 (8)	13.0
Iran	19,114	28.0 (10)	123.0
Saudi Arabia	17,472	72.6 (6)	-5.9
Malaysia	10,674	43.8 (7)	31.7
Morocco	10,113	33.1 (9)	9.7
Nigeria	9,105	7.5 (12)	-8.4
Pakistan	7,832	5.3 (13)	24.5
Jordan	6,384	119.3 (3)	24.3
Kuwait	5,930	254.5 (1)	-0.5
Lebanon	5,341	152.6 (2)	12.5
Indonesia	5,118	2.4 (15)	12.5
Bangladesh	4,745	3.5 (14)	15.5
UAE	4,389	108.6 (5)	30.0
Uzbekistan	3,924	15.1 (11)	-11.0

Table 1: OIC member states publishing the highest no. of S&T papers from 1995-2004 (Source: www.comstech.org.pk)

*% change over 2002-2004 compared with the 1998-2004 average

Figures show several shortfalls

- First, the actual numbers of publications are very small.
- Muslim countries contribute just 2.5% of ~11.5 m papers published worldwide each year.
- Reflects the low value placed on scientific research in general, & publishing research findings in particular, within the Islamic world.

- 3 largest Muslim countries by population — Indonesia, Pakistan & B'Desh — are not the most productive in S&T. Indeed, when considering science publi./million of population, smaller countries like Kuwait fair better.
- This disparity between countries suggests that a vast no. of Muslims around the world are virtually excluded from the worldwide scientific enterprise.

- In addition, scientists in the Muslim world tend not to publish in some of the technological fields that have contributed to economic growth in the West — c.f., semiconductor, IT, genetics & nanotech.

  This absence represents a weakness in these countries' ability to translate Scientific research into useful technologies that support economic dev.

- **Finally, none of the 25 productive (by publication count) scientific institutes in Islamic countries — such as Ankara Univ., Cairo Univ. King Fahd Univ. — appear on the list of top institutions worldwide.**

  As scientists' decision & motivation are affected by institutional quality, environment & incentives, this institutional deficit may, in part, explain the low scientific productivity in the Muslim world.

Muslim science must join the 21st century

- OIC's study of scientific research in the Muslim world shows that it lags far behind the rest of the world, but there are encouraging signs of improvement.
- If Muslim countries are to become innovative & knowledge-based societies of the 21st century, they need to develop coherent & relevant S&T policies & create an environment supportive of research.

Qur'an Leads the Way to Science

- Allah summons humanity to investigate & reflect upon the heavens, the earth, mountains, stars, plants, seeds, animals, the alternation of the night & the day, the creation of man, the rain & many other created things. Examining these, man comes to recognize the artistry of Allah's creation in the world around him, & ultimately, to know our Creator, Who created the entire universe & everything in it.
- "Science" offers a method by which the universe, & all the beings therein, may be examined to discover the artistry in Allah's creation, thereby communicating it to mankind.
- Religion, therefore, encourages science, adopting it as a tool by which to study the subtleties of Allah's creation.

Turning the Tide

- While the OIC's findings make for depressing reading, there are some indicators of a change sweeping across the Muslim world. **Iran, Pakistan & Turkey** show a clear upward trend in scientific output (see Table 1) - all of which have **recently made large increases to scientific spending**.

  Pakistan has increased funding for tertiary education by 5,000% over the last 5-7 years.

- **Qatar, through its Doha Educ. City, is trying to become the education & knowledge hub of the region.**

  Similarly, Nigeria announced plans to invest US$ 5 b in S&R over the next decade for making substantial gains in economic growth & dev.

- **Study's Findings (Closer Look)**

  A lack of diversity in subject in scientific publications.

  While many OIC countries may have small islands of scientific excellence, they seriously lack the broad-based scientific capability & infrastructure needed to see broader societal gains.

Intelligent policies and patient implementation

- Muslim world need urgent initiatives & policies that can support the use & dev. of S&T infrastructure.
- Must promote academic freedom & set up well-designed research funding programs, quality educational & research institutes, & offer incentives for undertaking & publishing research.

- **Islamic countries also need to promote the value of S&T to the general popul.**

  And they must learn to use science to solve socio-economic problems such as disease, resource shortages, & economic dev.

- **Only through an intelligent use of policy, followed by patient & committed imple-mentation, can the Muslim world move out of the scientific backwaters to become equal participants & beneficiaries of the scientific age.**

The Importance of Research

I. The need for good knowledge

II. What is good knowledge?

- Objective: not due to idiosyncracies of the individual observer
- Replicable (repeatable)
- Communicable so that:
  a. Results can be replicate
  b. Knowledge can be applied
  c. Scientists can build on each others work (value of teamwork in science)

III. How you will benefit from knowing how to do good research.

- **As an educated person, knowing about research will give you the ability to:**

  * Accurately & systematically collect data that will answer questions
  * Analyze & attack problems; and
  * Communicate and justify both your approach to a problem & your conclusions.

- **As someone who may be entering the workforce, the ability to collect, analyze, think about, & communicate about data will prove very marketable & useful in today's information age.**

Now speaking in a different language

WHAT IS RESEARCH ALL ABOUT, ANYWAY?

Answer:

- Increasing our understanding of how and why we behave the way we do!!

A THEORY

- Organizes information
- Helps explain past events
- Predicts new events

RESEARCH IS BASED ON THE WORK OF OTHERS

- Past research guides new research
- Research is NOT copying the work of others

RESEARCH CAN BE REPLICATED

- Repeatability is a sign of credible science
- Replication guides future research

RESEARCH IS GENERALIZABLE

- Research should apply to situations outside of the study setting

RESEARCH IS NOT DONE IN INTELLECTUAL ISOLATION

- It is based on some logical rationale
- It is tied to theory

RESEARCH IS "DOABLE"

- Good research questions can be translated into projects that can be done!

RESEARCH IS ONGOING

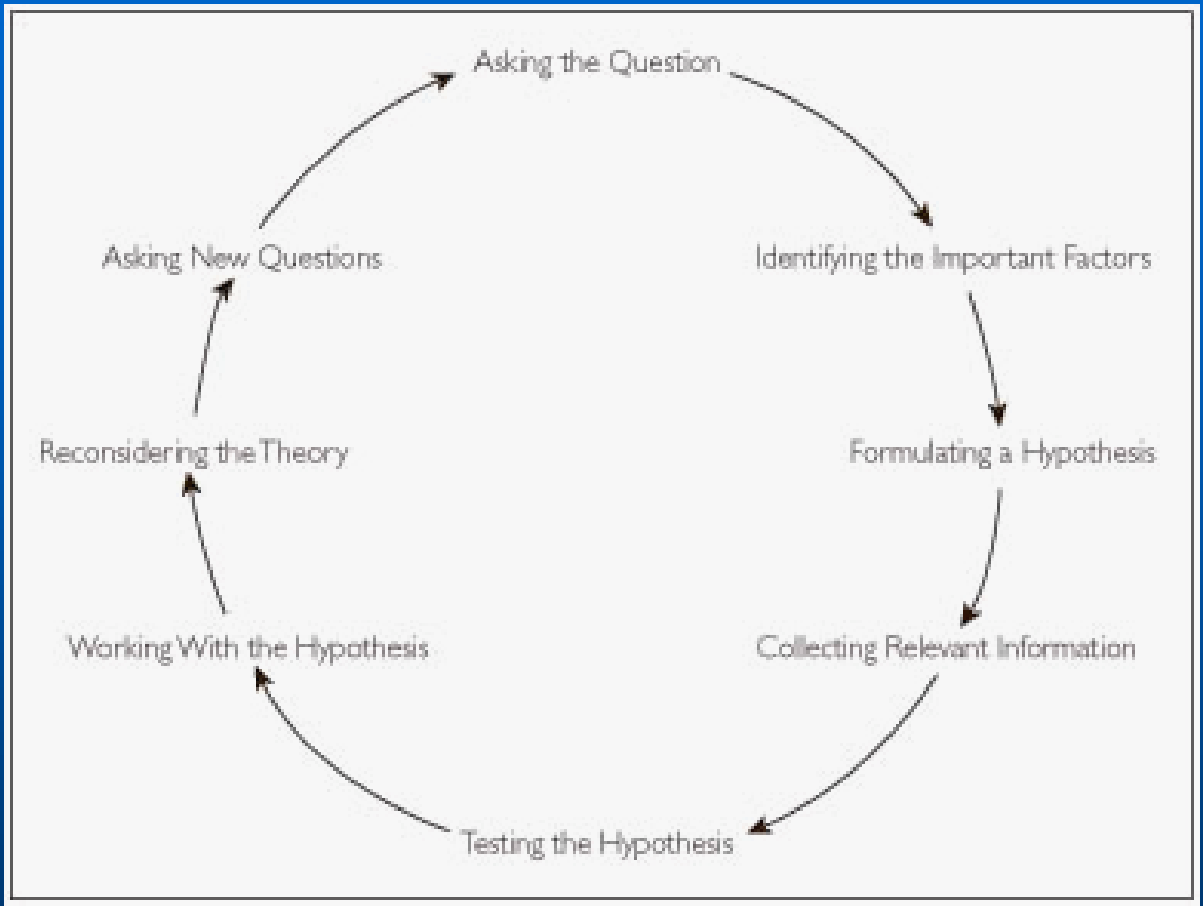
- Research generates new questions
- Research is incremental

RESEARCH IS APOLITICAL

- Research should have the betterment of society as its ultimate goal

SCIENTIFIC METHOD

- A shared philosophical approach to understanding the world
- A standard sequence of steps in formulating & answering questions



Steps in the research process

QUESTIONS

- Asking a question
- Identifying a need

IDENTIFYING IMPORTANT FACTORS

- Not fully investigated
- Advance understanding
- Can be investigated
- Are interesting
- Lead to more questions

FORMULATING A HYPOTHESIS

- "If…then" statements
- Objective extension of the original question
- In a testable form

COLLECTING RELEVANT INFORMATION

- Hypotheses posit a relationship between different factors
- Data are collected that will confirm or refute the hypothesis
- Hypotheses are testable (not provable)

TESTING THE HYPOTHESIS

- Inferential statistics
  - Separate effects of factors from effects of chance
  - Assign a probability level to obtained data

WORKING WITH THE HYPOTHESIS

- If the hypothesis is confirmed
  - Plan new research
- If the hypothesis is refuted
  - Try to understand what other factors might be important

RECONSIDERING THE THEORY

- Theories can be modified
- Leading to new questions

DIFFERENT TYPES OF RESEARCH

- Nature of question asked
- Method used to answer question
- Degree of precision of method

NONEXPERIMENTAL RESEARCH

- Describe relationships between variables
- Cannot test cause-and-effect relationships

DESCRIPTIVE RESEARCH

- Describes characteristics of existing phenomena
- Provides a broad picture
- Serves as basis for other types of research

HISTORICAL RESEARCH

- Describes past events in the context of other past or current events
- Primary and secondary sources of data

CORRELATIONAL RESEARCH

- Asks what several events have in common
- Asks whether knowing one event can allow prediction of another event
- Does not imply causation

QUALITATIVE RESEARCH

- Examines behaviour in natural social, cultural, and political contexts
- Usually results in non-quantitative data

EXPERIMENTAL RESEARCH

- Tries to discover causal relationships

Two types

- True experimental research
- Quasi-experimental research

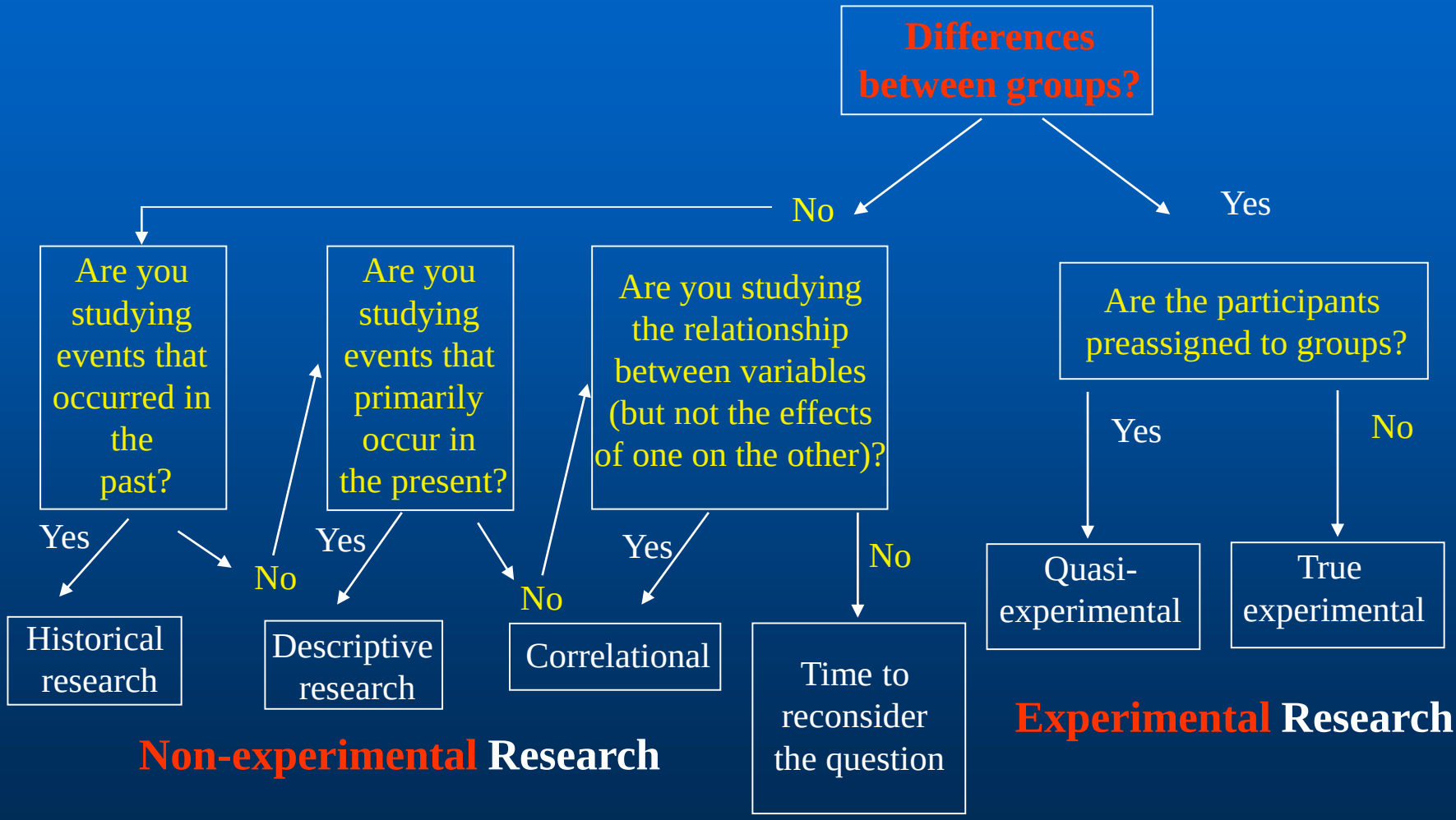
TRUE EXPERIMENTAL RESEARCH

- Participants assigned to groups
- Treatment variable is controlled by researcher
- Control of potential causes of behavior

QUASI-EXPERIMENTAL RESEARCH

- Participants are preassigned to groups
- Useful when researcher cannot manipulate variables

WHAT METHOD TO USE WHEN?



APPLIED vs. BASIC RESEARCH

- Basic research has no immediate application
- Applied research has immediate applications

BOOKS, WEB

- Finding Books
- Finding Articles
  - How to find articles
  - How to cite articles
- Searching the Web
  - Why the web
  - How to search the Web
  - Search Tools
  - How to cite Web sources
- Citing sources
  - How to cite
  - Plagiarism: What is it?
  - Copyright & fair use

RESEARCH OPPORTUNITIES

- **Home**
  - Universities (Raj, Dhaka, Chitt, Sylhet, JNU,AEC, BCSIR, Agric.Univ.,Med Univ.,BCSIR)
  - Institutions

    Example: at RU => IBS, IBSC, IER, Environmental
  - Others
- **Abroad**
  - Australia, Malaysia, Middle East, Sweden USA/UK etc

FUNDING OPPORTUNITIES

- UGC
- Institutions/Univ
- IDB
  - Doctoral Research Grants
  - Japan-IDB Scholarships ****
  - World-wide M.Sc. in S&T (Muslims from very poor countries): Sudy in Malaysia, ******
- Assistantship/Scholarship Abroad
  - Malaysia, Korea, Australia, Swden, Norway, USA etc

STUDY LEAVE, OTHER KIND OF LEAVE

- Study leave
  - University (Public, Private)
  - Govt. College
- Leave without pay
  - Non-Govt. College/Other Institutions

THANK YOU