Quantitative Decision Making: Mathematical and Managerial perspectives

By

Emad El-Din Hussien Hassan

Faculty of Management Science
Modern Sciences and Arts University (MSA) — Egypt
Objective

To introduce an experiment of teaching the “Quantitative Decision Making” to each of students of Mathematics and Statistics Department (Cairo University) and students of Management Science Faculty (MSA University) showing the common points and the differences between the two courses.
Quantitative Decision Making

- **Mathematically:**
  It is about how to create and apply mathematical structures and theorems that can be used to design numerical methods techniques of finding the optimum solutions of decision making problems [2].

- **Managerially:**
  It is about how to use the numerical (quantitative) Methods and mathematical results in order to find the optimum possible decisions in different managerial and economical cases [1].
On Designing Courses

To design appropriate course, it is important to take the following in consideration:

- The background and previous knowledge of the students
- The objectives of the course including knowledge and skills supposed to be gained by the students by the end of the course.

The above points yield the appropriate methods and techniques that will be used in the course including:

- Motivation
- Approach
- Teaching methods
- Training
- Assessment
1) Different Backgrounds

Mathematics students are supposed to have deep knowledge about mathematical and statistical terms like:

- Theorem, Lemma, Corollary
- Assumption
- Proof
- Algebraic operations
- Ordering
- Differentiability, Non-differentiability
- Algorithm
- Convex set, Concave set
- Probability distribution
- Maximum and minimum point
- Randomness
- Running time

Management science students are supposed to have deep knowledge about managerial and economical terms like:

- Decision
- Product
- Profit, Loss, Risk, cost
- Facility location, Path,
- Optimum decision
- Combination
- Purchase, Merchandizing
- Hire, Fire
- Overtime
- Subcontracting
- Layout
2) Goals and Objectives

- With respect to students of Mathematics and Statistics the course aims the students to know how to build quantitative methods needed to solve decision making problems, test and prove of validity and effectiveness of these methods, also the students have to be acquainted with how to apply this quantitative methods in real life problems.

- With respect to students of Management Sciences the course aims the students to know how to transform managerial cases into appropriate mathematical models, how to solve it using suitable mathematical techniques and also aims them to gain general undetailed knowledge about the mathematical theorems and derivations stand behind these methods.
3) Motivation

- Students of Mathematics and Statistics are always asking about the fields in which the deep mathematical structures and results they study can be used. This course is excellent chance to show them that the distance between the pure mathematics and applications in real life is not so long.

- Students of Management sciences are always wondering about why they study mathematics and what we can do by the simple mathematical skills that they study in he beginning level courses. This course is a good chance to show them that using mathematical techniques makes differences in the field of decision making, Management and Economics.
4) Course contents

Both the two considered courses contain similar titles like:

- Linear programming
- Queueing systems (waiting line systems)
- Decision analysis
- Game theory
- Etc.

Every topic of these can be introduced using either of mathematical or managerial approach
5) Approaches

- **Mathematical Approach:**

In this approach the mathematical background and theorems needed for each of the above topics are studied, then we introduce the derivations of the technique(s) that will be used to solve the problems investigating the validity of each technique and its computation complexity, then little real life applications has to be clarified.
Managerial approach:

Discussion of each topic here started by the managerial cases that can be solved using the techniques of this topic, and how to formulate these cases in the mathematical model of the technique, after that we introduce the method by which we can solve this model and finally students have to know how to interpret managerially and report the resulted solution, so we can divide the work in the following stages:

I. Formulation (changing the managerial case into mathematical model)

II. Solution of the mathematical model

III. Reporting the resulted solution managerially
6) Teaching Methods

**Mathematical course:**
- Class lectures and discussions
- Problem sessions
- Students presentations
- Software packages (Maple, Mathematica, Arena,…)

**Managerial course:**
- Class lectures and discussions
- Cases study
- Problem sessions
- Software packages (Management Scientist, Excel, Arena,..)
7) Assessments

The Assessment techniques for the mathematical course include:

- Unseen exams concentrating on the mathematical proofs and comparisons of the techniques
- Class discussion and presentations
- Homework problem solving assignments

The assessment techniques for the managerial course include:

- Unseen mid-term and final exams including varieties of managerial cases to be modeled, solved and reported
- Oral and written problem solving
- In class and homework cases study and mini projects.
References

1) An Introduction To Management Science, Quantitative Approaches to Decision Making, David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Kipp Martin, Thomson-South-west publishing, 12th edition

2) Operations research, Hamdy A. Taha, Macmillan, 9th edition
Thanks

Questions and discussions