

Macao Polytechnic Institute
School of Health Sciences and Sports
Bachelor of Science in Biomedical Technology
(Medical Laboratory & Pharmacy Technology)

Module Outline
Academic Year 2020 / 2021 Semester 2

Learning Module	Research Methods		Class Code	BSRM3102
Pre-requisite(s)	Nil			
Medium of Instruction	English / Cantonese		Credit	4
Lecture Hours	40 hrs	Lab/Practice Hours	20 hrs	Total Hours 60 hrs
Instructor	Grace Meng / Professor Pedro Fong / Associate professor		E-mail	lrmeng@ipm.edu.mo pedrofong@ipm.edu.mo
Office	M730, M705, Meng Tak Building, Main Campus		Telephone	85993449 85993427

Description

This 60-hour learning module aims to improve the understanding of students in healthcare research with emphasis on the concept of scientific investigation; experimental design; research project planning; data measurement and collection; qualitative and quantitative data analysis; research proposal and poster creation; the basic concepts of ethical issues in scientific and medical research; research utilization and evidence based practice. This course also prepares students for writing thesis, medical articles and research papers.

Learning Outcomes

After completing the learning module, students will be able to:

1. Understand the purpose and concepts of medical research.
2. Propose and implement research project.
3. Analysis and Interpret research results.
4. Evaluate research articles.
5. Compose research poster.
6. Understand of basic concepts in research utilization and evidence based practice.
7. Write research reports and thesis.

Content

1. Subject introduction (2 hours)
 - 1.1 Academic research
 - 1.2 Key terms in research
 - 1.3 Dimensions of research
 - 1.4 General research process
 - 1.5 Key challenges of conducting research

2. Basic concepts in research (2 hours)
 - 2.1 Topic
 - 2.2 Research problems
 - 2.3 Research questions
 - 2.4 Hypotheses
 - 2.5 Statement of purpose
 - 2.6 Aims and objectives

3. Research ideas (2 hours)
 - 3.1 Source of research ideas
 - 3.2 Global health agendas

4. Development of research problems (2 hours)
 - 4.1 Significance of the problems
 - 4.2 Researchability of the problem
 - 4.3 Time and timing
 - 4.4 Availability of study participants
 - 4.5 Co-operation
 - 4.6 Facilities and equipment
 - 4.7 Cost
 - 4.8 Experience of the researcher
 - 4.9 Case studies and group exercises

5. Selection of study participants (2 hours)
 - 5.1 Populations and samples
 - 5.2 Clinical and community populations
 - 5.3 Convenience and probability samples
 - 5.4 Selection criteria
 - 5.5 Subject information sheet / consent form

6. Data collection approaches (2 hours)
 - 6.1 Self reports
 - 6.2 Observation

- 6.3 Biophysologic measures
- 6.4 Data collection plan

- 7. Questionnaires (4 hours)
 - 7.1 Designing questionnaires
 - 7.2 Styles and wording in questionnaires
 - 7.3 Method of distribution / recruitment
 - 7.4 Examples and exercises

- 8. Research bias and controls (2 hours)
 - 8.1 Haphazard bias
 - 8.2 Systematic bias
 - 8.3 Group exercises

- 9. Qualitative data analysis (2 hours)
 - 9.1 Transcribing
 - 9.2 Categorization
 - 9.3 Coding
 - 9.4 Field notes

- 10. Quantitative Research (4 hours)
 - 10.1 Introduction to Quantitative Research
 - 10.2 Model for Conceptualizing Quantitative Research
 - 10.3 Creating the Foundation for Quantitative Research
 - 10.4 Research Hypotheses for Quantitative Research
 - 10.5 Research Questions in Quantitative Research
 - 10.6 Types of Variables
 - 10.7 Making the Case for Quantitative Research

- 11. Research proposal (8 hours)
 - 11.1 Aims of proposal
 - 11.2 Funding application
 - 11.3 Content and format of proposal
 - 11.4 Tips on successful proposal

- 12. Ethical Issue (2 hours)
 - 12.1 Respect for persons
 - 12.2 Beneficence
 - 12.3 Review board approval
 - 12.4 Special regulations for vulnerable

13. Scientific journal (4 hours)
 - 13.1 Content of journal articles
 - 13.2 Professional magazines and peer review journal
 - 13.3 Science citation index
 - 13.4 Letters
 - 13.5 Research notes
 - 13.6 Research articles
 - 13.7 Supplemental articles
 - 13.8 Review articles
 - 13.9 Impact factor
 - 13.10 Examples

14. Copyright and plagiarism (2 hours)
 - 14.1 Authorship
 - 14.2 Rights to authors
 - 14.3 Reprints and postprints
 - 14.4 Responsibilities of investigators
 - 14.5 Scientific misconduct
 - 14.6 Conflicts of interest
 - 14.7 Types of plagiarism
 - 14.8 Examples

15. Literature review (6 hours)
 - 15.1 Purposes of literature review
 - 15.2 Content of literature review
 - 15.3 Skills and styles in writing literature review
 - 15.4 Organization framework for literature review
 - 15.5 Examples and group exercises

16. Research Poster (2 hours)
 - 16.1 Purposes of scientific posters
 - 16.2 Content of scientific posters
 - 16.3 Skills in making effective scientific posters

17. Introduction to data science research I (3 hours)
 - 17.1 Relational databases for healthcare professional
 - 17.2 ER model and relational model
 - 17.3 Structured Query Language (SQL) exercises
 - 17.4 Research article sharing: *A large-scale dataset of in vivo pharmacology assay results*

18. Introduction to data science research II (3 hours)
 - 18.1 Medical ontologies and semantic web data
 - 18.2 Resource Description Framework (RDF)
 - 18.3 SPARQL tutorial
 - 18.4 Research article sharing: *Biomedical Informatics on the Cloud*

19. Introduction to data science research III (2 hours)
 - 19.1 Statistical analysis of biomedical data using R
 - 19.2 R-studio tutorial: summary statistics and hypothesis testing

20. Oral defense (4 hours)

Teaching Method

Lectures, audios, videos, case studies and group discussion. Approximately 10% of the course contents will be taught using active learning instructional strategies.

Attendance

Attendance requirements are governed by the “Academic Regulations Governing Bachelor’s Degree Programmes of Macao Polytechnic Institute”. Students are not eligible to attend the final examination and re-sit examination, moreover, an “F” will be given as the final grade to students who have less than the stated attendance for the enrolled module.

Assessment

This learning module is graded on a 100-score scale, with 100 being the full score and 50 the passing score. Any student scoring less than 35% of the total mark in the presentation will be given an “F” grade for the learning module even if the overall grade is 50% of higher.

	Item	Description	Percentage
1.	In class exercises	Literature review	8 %
2.	Assignment 1	Qualitative and Quantitative Research	9 %
3.	Assignment 2	Questionnaire	9 %
4.	Assignment 3	Relational database queries (Pedro)	7 %
5.	Assignment 4	Data visualization & analytics (Pedro)	7 %
6.	Assignment 5	Proposal	30 %
7.	Presentation	Oral defense	30 %
		Total Percentage:	100 %

Teaching Material(s)

Textbook(s)

Stepjhen Polgar, & Shane A. Thomas. (2008) Introduction to Research in the Health Sciences, Churchill Livingstone.

王健。衛生管理科研方法. (2013) 人民衛生出版社.

Reference

Reference book(s)

Carolyn Hicks. (2009) Research Methods for Clinical Therapists. Churchill Livingstone.

Felicity Smith & Sally-Anne Francis. (2008) International Research in Healthcare. Pharmaceutical Press.

Hulley, Stephen B.; Cummings, Steven R.; Browner, Warren S.; Grady, Deborah G. & Newman, Thomas B. (2007) Designing Clinical Research. Lippincott Williams & Wilkins.

Tom Heath and Christian Bizer. (2011) Linked Data: Evolving the Web into a Global Data Space. Morgan & Claypool Publishers.