

RESEARCH METHODOLOGY (SQG2613)

Formulate Research Problems and Research Objectives

Dr Nik Ahmad Nizam Bin Nik Malek,

BSc (Ind. Chem.)(UTM), MSc (Chem)(UTM), PhD (Chem)(UTM), A.M.I.C

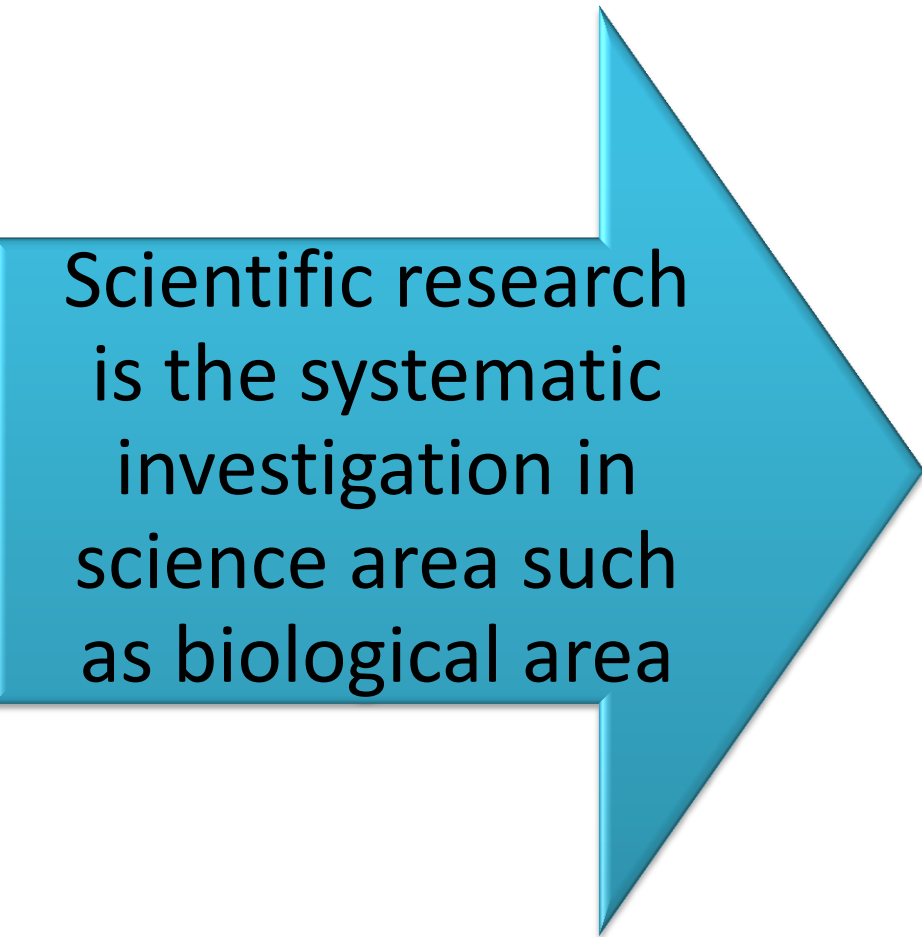
Senior Lecturer,

Department of Biotechnology and Medical Engineering

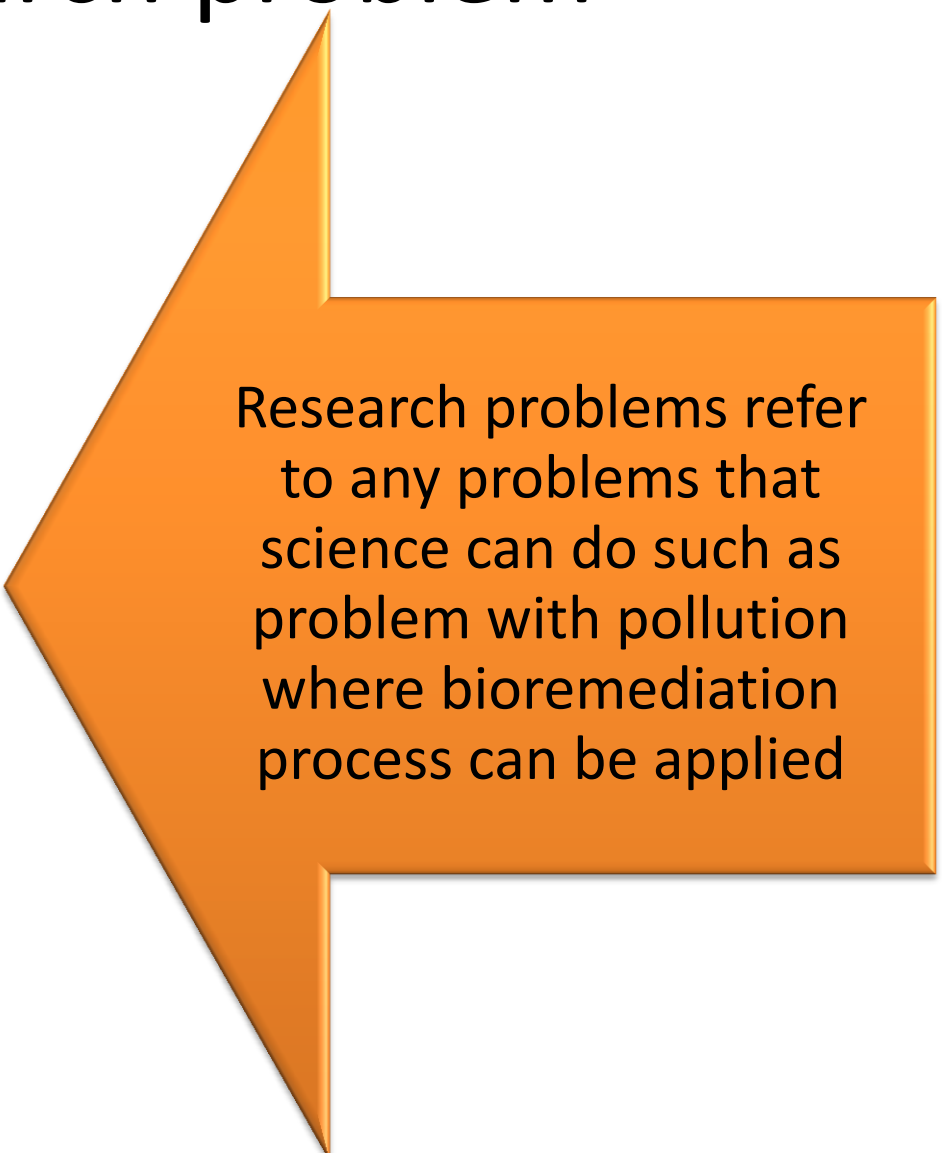
Faculty of Biosciences and Medical Engineering



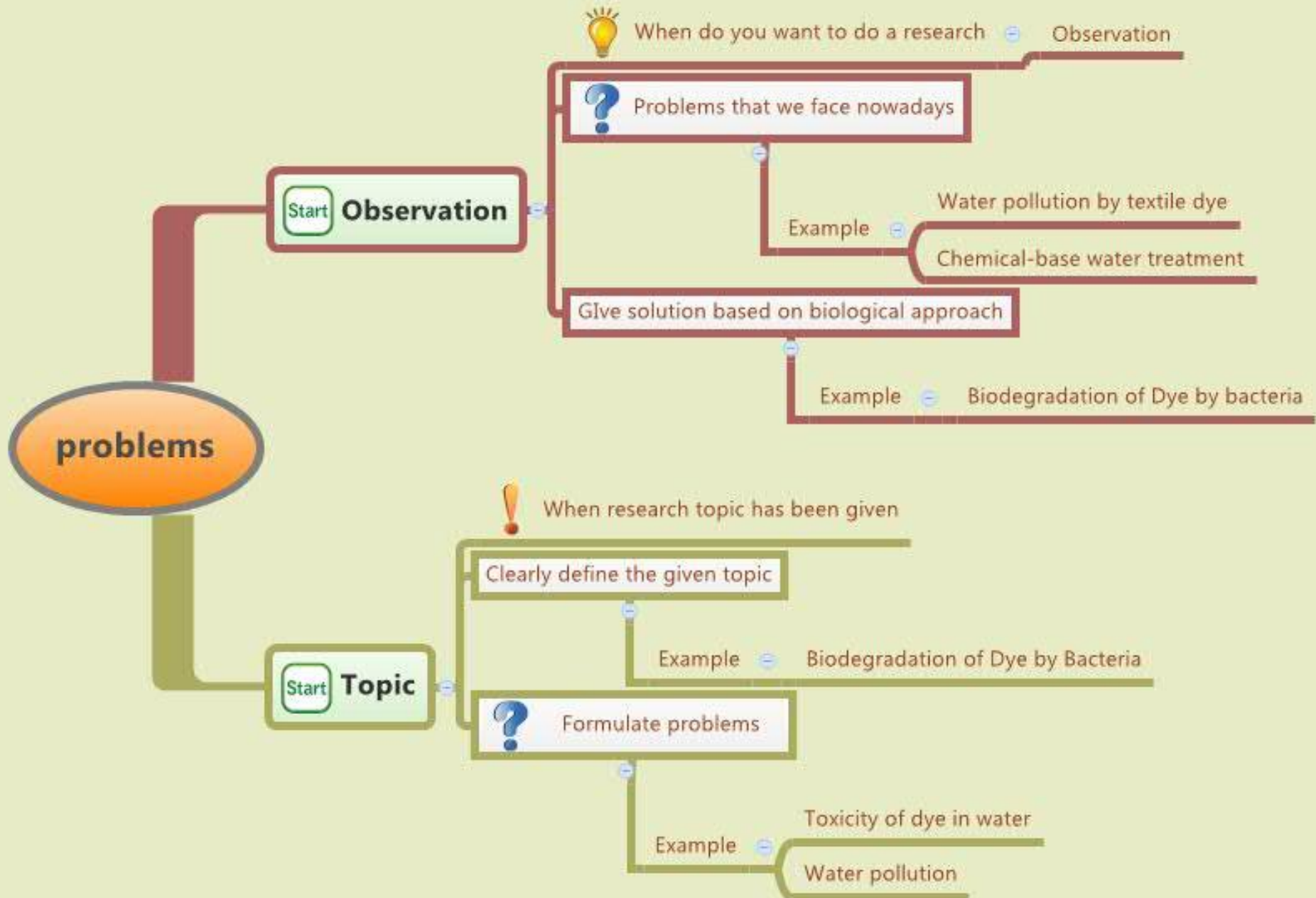
What is research problem



Scientific research is the systematic investigation in science area such as biological area

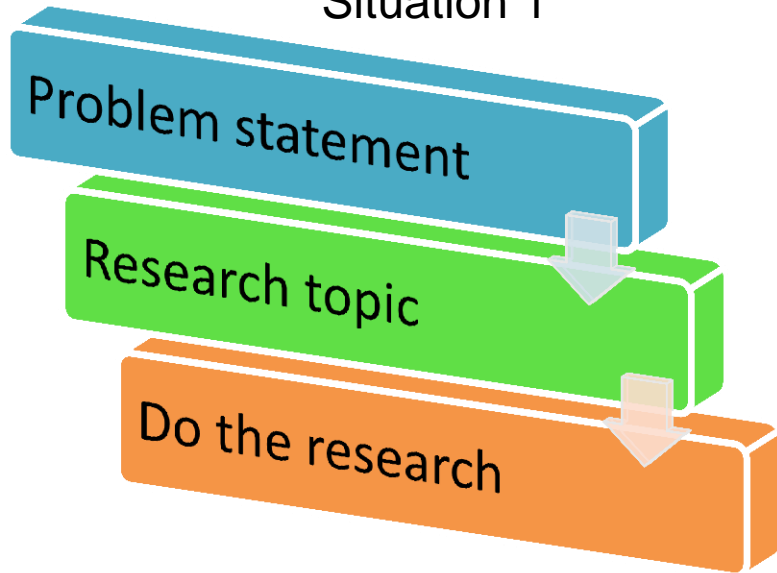


Research problems refer to any problems that science can do such as problem with pollution where bioremediation process can be applied

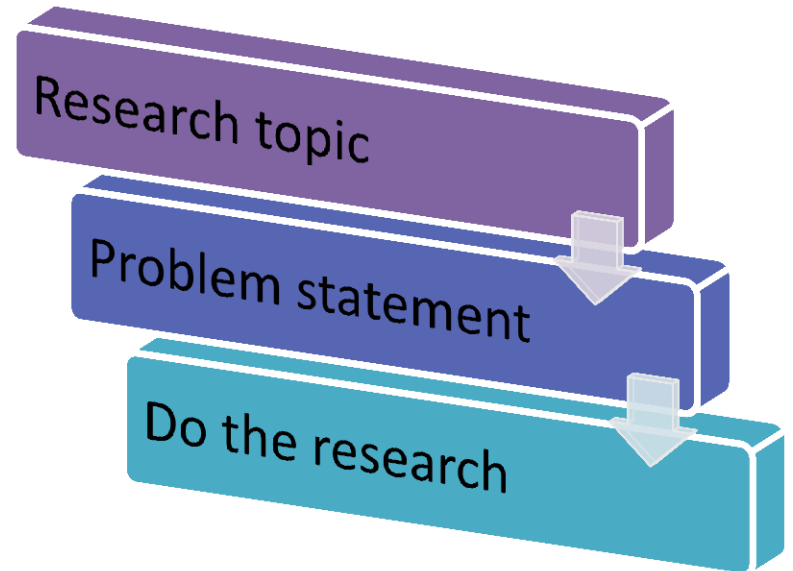




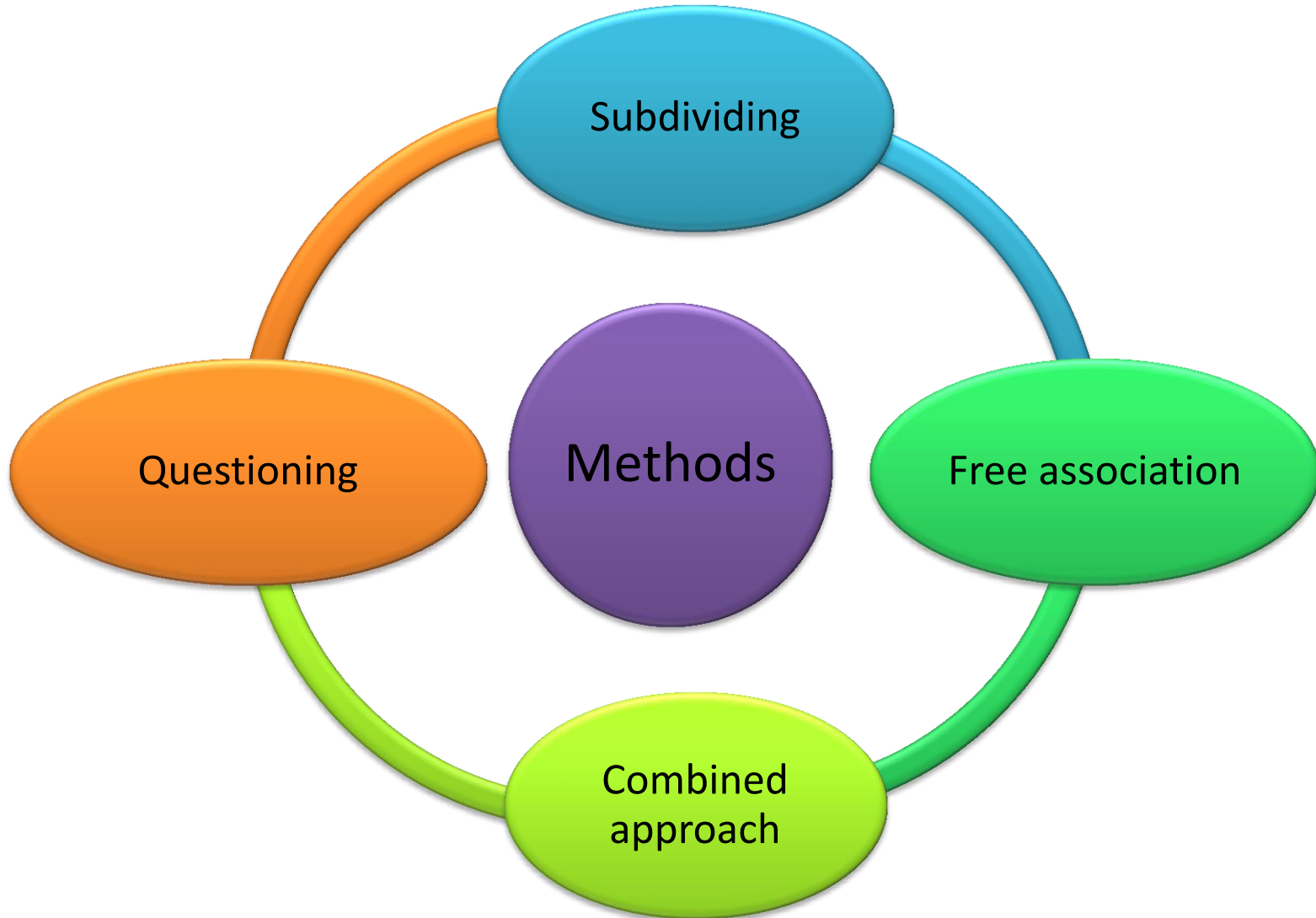
Situation 1



Situation 2



Formulating Research Problems

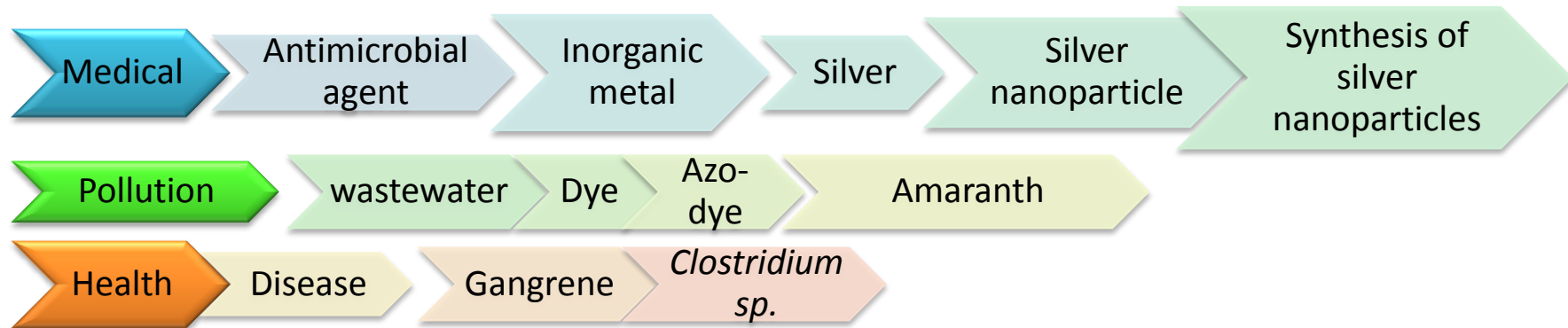


Formulating Research Problem

- Subdividing Approach
 - Start from main idea, such as pollution.
 - Divide the main idea into subtopic until become more specific.
 - Must be related to research field

Subdividing approach

Examples:



Formulating Research Problem

- Free Association Approach
 - One simple approach that comes out naturally.
 - Just write down any idea, issue or problem that related to our research whenever appear in our mind.
 - It usually happens when we read related literatures, having discussion etc.

Free Association Approach

Examples:

Development of new antibacterial agents

Problem with current antibacterial agents

Problem with bacteria resistance to antibiotic

Problem with diseases-related pathogenic bacteria

Hygienic lifestyle

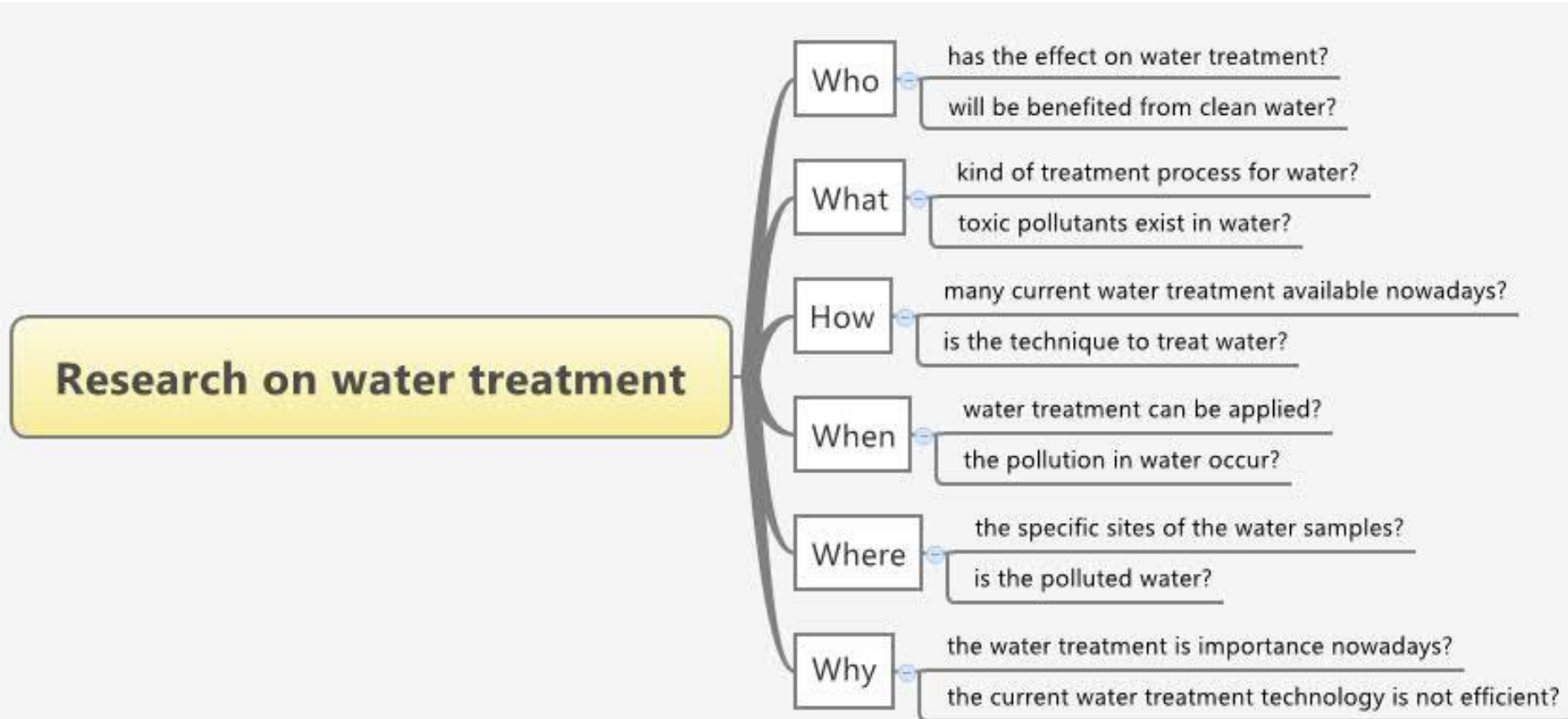
Formulating Research Problem

- Asking Questions Approach

- WHO? People
- WHAT? Problems, things, ideas
- WHERE? Places
- WHEN? Past, present, future
- WHY? Causes, reasons, results, conditions
- HOW? Methods, techniques, mechanisms

Asking Question Approach

Example



Formulating Research Problem

- Combined approach
 - Combination of different approaches:
 - Subdividing + Free association approach
 - Subdividing + Asking question approach
 - Free association approach + Asking question approach
 - Subdividing + Free association + Asking question approach

Problem statement

“a problem statement should be specific, manageable, and written to stimulate reader interest”



ELSEVIER

Available online at www.sciencedirect.com

Library & Information Science Research 29 (2007) 307–309

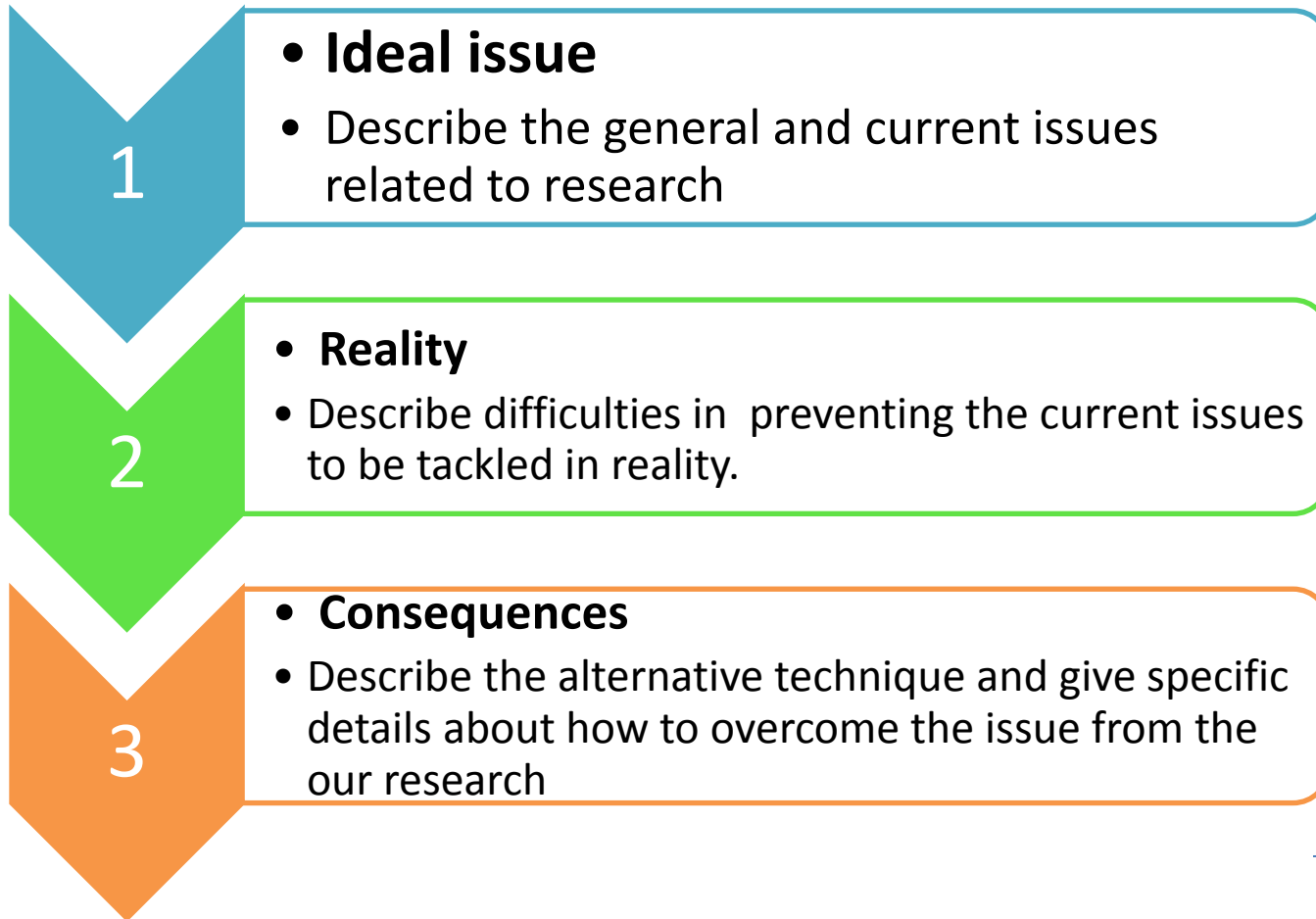
**Library &
Information
Science
Research**

Editorial

What is a problem statement?

In reviewing numerous manuscripts for possible publication in this peer-reviewed journal, as well as reading numerous studies published in other journals, we repeatedly find that problem statements are absent or incomplete, and there seems to be continuing confusion as to what comprises a problem statement. Are purpose and problem statement synonymous? Does a study objective, hypothesis, or summary of the content of the report comprise a problem statement? To add to the confusion, research methods textbooks in the social sciences do not clarify the matter, although they may note that research examines problems or that it engages in problem solving.

Formulate Research Problems



Combine with connective words

Such as,
“however”,
“unfortunately”,
“despite of”,
“therefore”,
“hence”, “thus”
etc.

Example of Problem Statements

Problem 1:

Research topic: Biodegradation of Textile Dye using Bacteria

Statement 1: Textile dye is useful for coloring cloth.

Statement 2: However, textile dye that accumulate in river water can cause pollution because textile dye is hazardous to the environment.

Statement 3: Textile dye in river water can be treated by biodegradation with bacteria.

Example of Problem Statements

Problem 2:

Research topic: Biodegradation of Textile Dye using Bacteria

Statement 1: Textile dye in water can be treated by using chemical such as by the adsorption on activated carbon.

Statement 2: But, the used of activated carbon is very expensive and create solid waste problem.

Statement 3: So, one of the alternative that can be used to treat textile dye in water is by biodegradation using bacteria since it does not create solid waste problem and cheap.

Tips on how to write good problem statement

- What you can get from this introduction:
 - How author write about introduction.
 - How author review paper from other sources.
 - Scientific term that author used.

Chemosphere 82 (2011) 507–513



FI SFVIFR

Contents lists available at ScienceDirect

Chemosphere

journal homepage: www.elsevier.com/locate/chemosphere

Biodegradation of 4-aminobenzenesulfonate by *Ralstonia* sp. PBA and *Hydrogenophaga* sp. PBC isolated from textile wastewater treatment plant

Han Ming Gan^a, Shafinaz Shahir^b, Zaharah Ibrahim^b, Adibah Yahya^{a,*}^a Department of Industrial Biotechnology, Faculty of Biosciences and Bioengineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia^b Department of Biological Sciences, Faculty of Biosciences and Bioengineering, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia

ARTICLE INFO

Article history:

Received 10 July 2010
 Received in revised form 27 October 2010
 Accepted 28 October 2010
 Available online 20 November 2010

Keywords:

Hydrogenophaga
Ralstonia
 4-Aminobenzenesulfonate
 Biodegradation
 16S rDNA

ABSTRACT

A co-culture consisting of *Hydrogenophaga* sp. PBC and *Ralstonia* sp. PBA, isolated from textile wastewater treatment plant could tolerate up to 100 mM 4-aminobenzenesulfonate (4-ABS) and utilize it as sole carbon, nitrogen and sulfur source under aerobic condition. The biodegradation of 4-ABS resulted in the release of nitrogen and sulfur in the form of ammonium and sulfate respectively. Ninety-eight percent removal of chemical oxygen demand attributed to 20 mM of 4-ABS in cell-free supernatant could be achieved after 118 h. Effective biodegradation of 4-ABS occurred at pH ranging from 6 to 8. During batch culture with 4-ABS as sole carbon and nitrogen source, the ratio of strain PBA to PBC was dynamic and a critical concentration of strain PBA has to be reached in order to enable effective biodegradation of 4-ABS. Haldane inhibition model was used to fit the degradation rate at different initial concentrations and the parameters μ_{max} , K_i and K_s were determined to be 0.13 h^{-1} , 1.3 mM and 42 mM respectively. HPLC analyses revealed traced accumulation of 4-sulfocatechol and at least four unidentified metabolites during biodegradation. This is the first study to report on the characterization of 4-ABS-degrading bacterial consortium that was isolated from textile wastewater treatment plant.

1. Introduction

4-Aminobenzenesulfonate (4-ABS) is one of the most commonly found sulfonated aromatic amines. It is widely used as an intermediate in the production of textile dyes, sulfonamide drugs, optical brighteners and pesticides. In nature, the biodegradation of 4-ABS is problematic. Unless there is a specific transport system for 4-ABS, the negatively charged sulfonate group would prevent uptake of the substrate through the bacteria membrane (Hwang et al., 1989). Even if bacteria develop an efficient uptake mechanism for 4-ABS, the thermodynamic energy barriers exerted by both the resonance-stabilized aromatic ring and C-S bond of 4-ABS, have to be overcome in order to harness energy from this

harbor sediment and even activated sludge from some wastewater treatment plants (Alexander and Lustigman, 1966; Tan et al., 2005; Yemashova and Kalyuzhnyi, 2006).

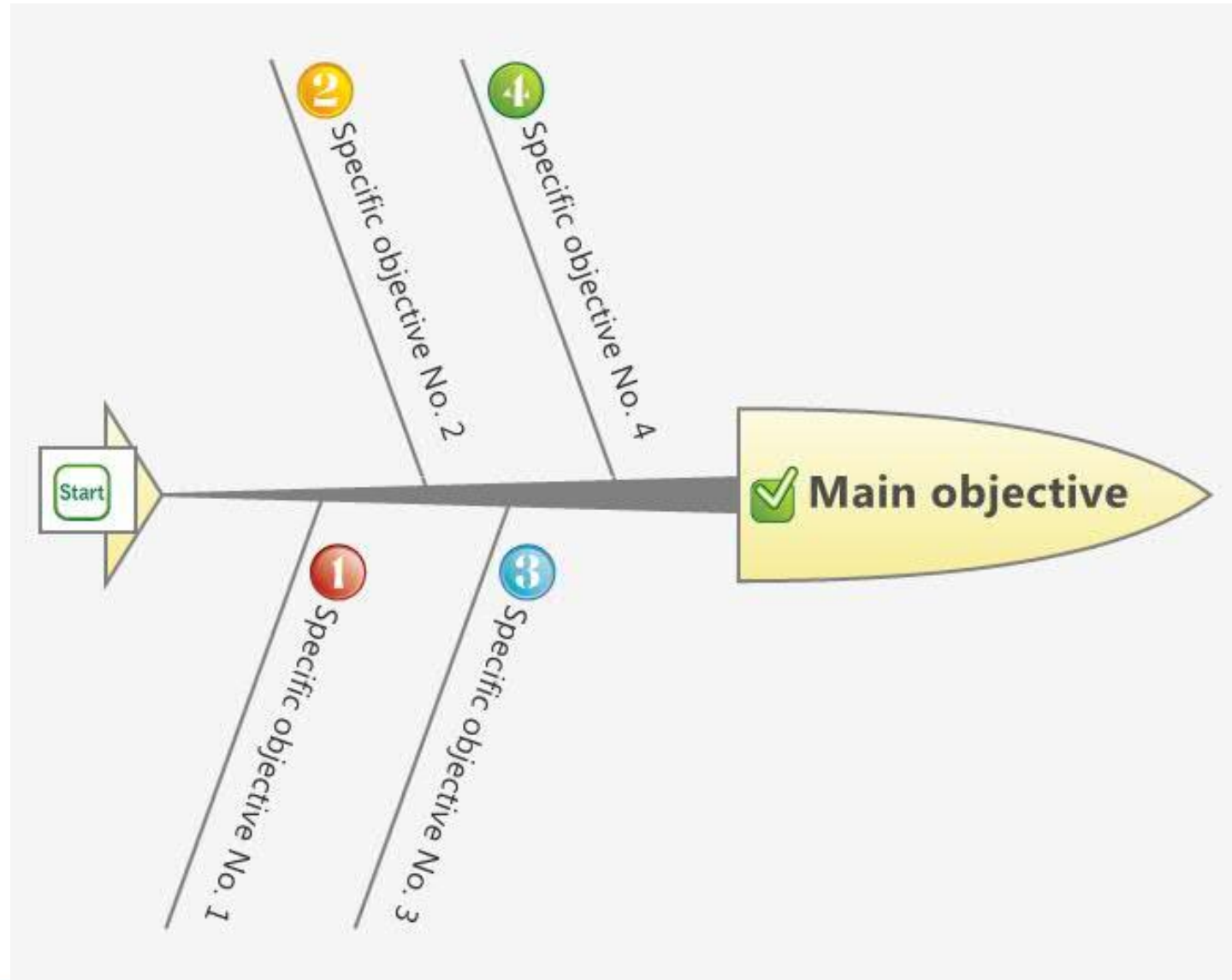
The consumption of most sulfonated aromatic amines commonly will result in the rapid excretion from organism (Greim et al., 1994). However, study in rats showed that 4-ABS has the longest retention time following ingestion as compared to its other counterparts (Honohan et al., 1979) thus making it the most significant compound to study. Under constant exposure to this compound, some negative effects of 4-ABS have been reported including hyperactivity in rats (Goldenring et al., 1982) and significant decrease in the nitrogen transformation processes in soil (Tonac et al., 2009).

Introduction

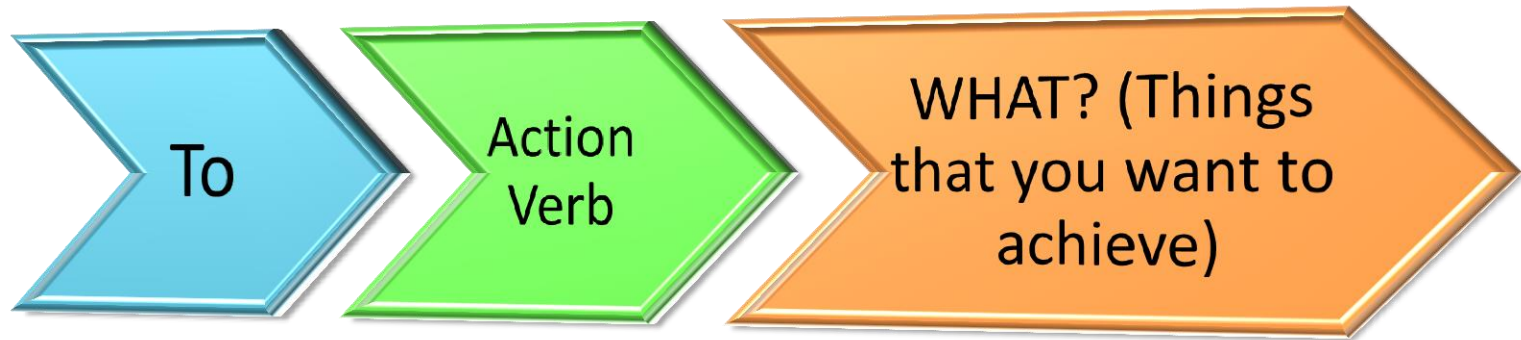
Research Objectives

- What do you want to achieve at the end of research?
- List of specific goals in your research.
- research questions rewritten in statement form.
- At the end of research, conclusion will answer the question from research objectives.

Research Objectives



Research Objectives



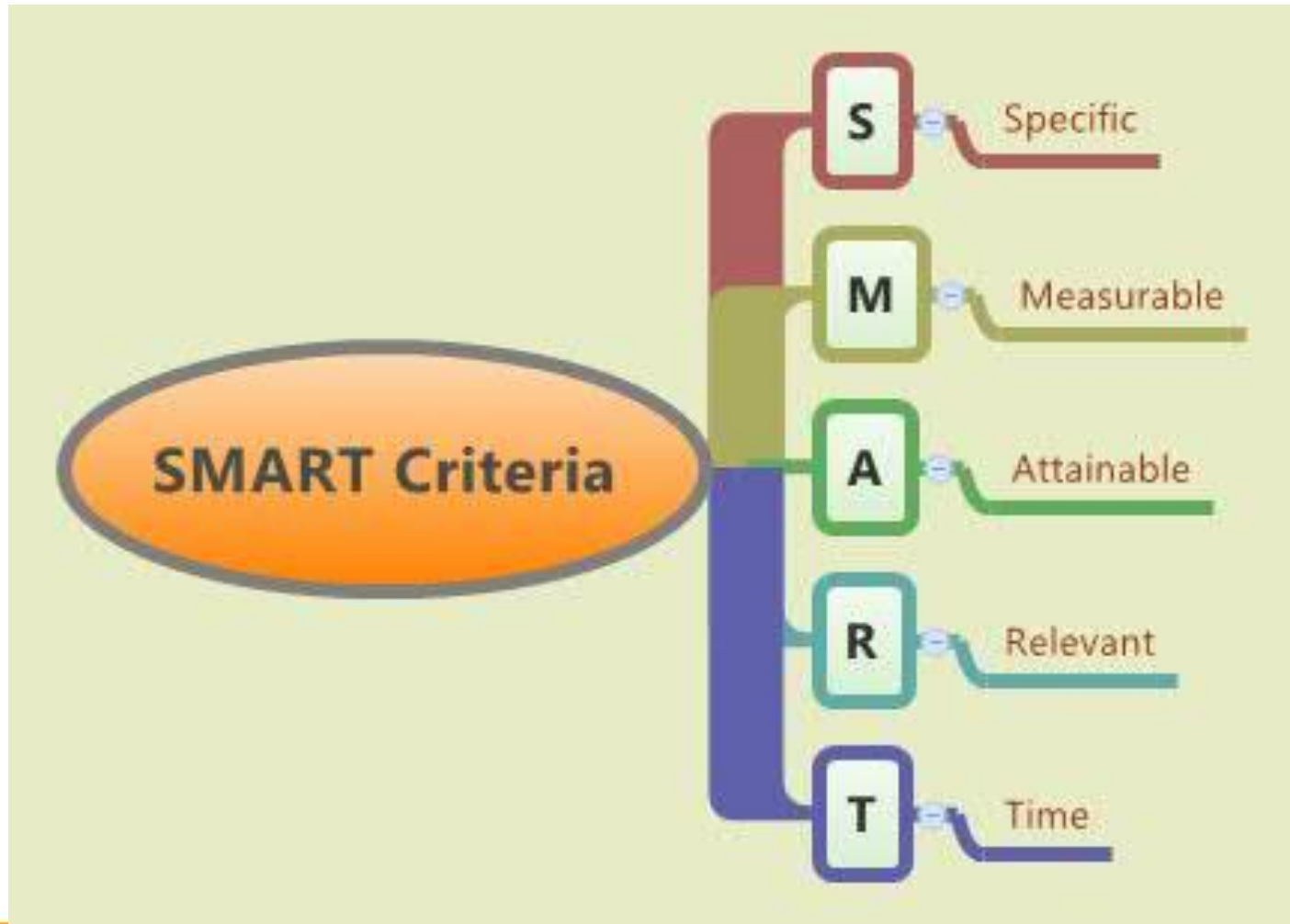
Action Verb

Determine,
find out,
verify,
perform,
carry out,
compare *etc.*

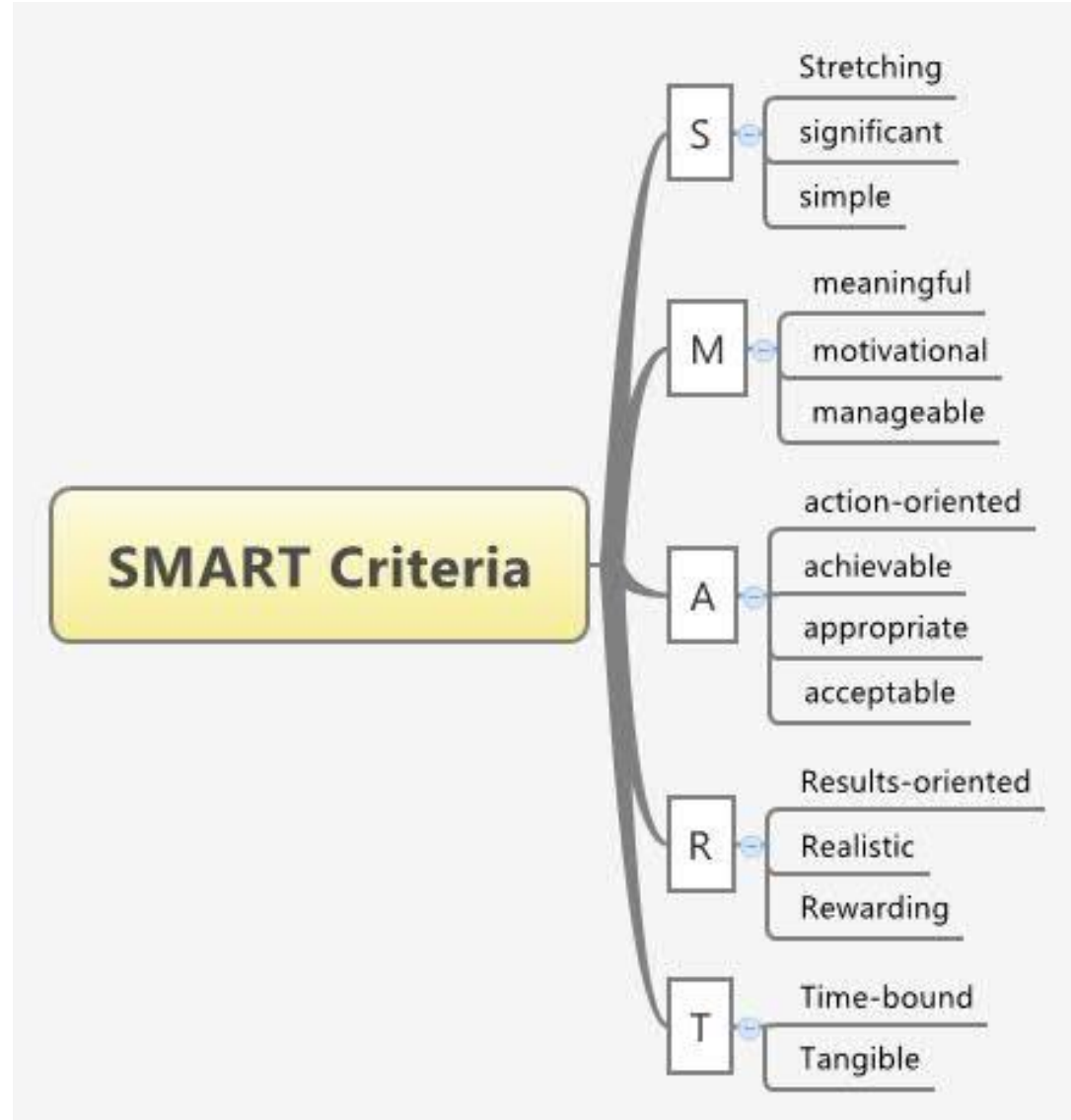
Prepare,
synthesize,
produce,
manufacture,
screen,
monitor *etc.*

Investigate,
examine,
explore,
study,
identify *etc.*

Research objective based on SMART criteria



Other elements in SMART criteria



S: Specific

- Research objective must be specific to the research topic.
- Example:
 - To isolate bacteria from **nature**.
 - **Nature**: general term. It can be from air, water, earth, forest etc.
 - To isolate bacteria from **textile wastewater treatment plant**.
 - Specific from textile wastewater.

M: Measurable

- Research objectives that can be **measured** at the end of research, can be **managed** through experimental and they are **meaningful** to the research
- How:
 - Understand the scientific approach and theory
 - List the availability of equipments/instruments/apparatus /infrastructure needed during experimentation.

A: Attainable

- Research objective that is possible to be achieved or attained in the given period and in the current situation.
- Example of objective that cannot be achieved (current situation):
 - To cure cancer
- Example of objective that can be achieved:
 - To study the effect of herbs on cancer cells

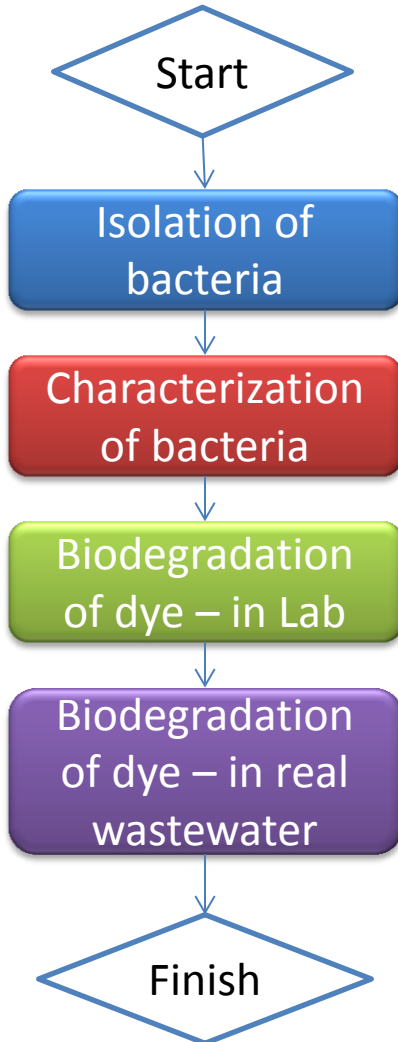
R: Relevant

- Research objectives that are **relevant** to the research topic and **realistic** to be carried out.
- Is the research objective in line and in accordance with the research topic.
- Example:
 - Research topic: Bioremediation of dyes in textile wastewater
 - Research objective: To isolate bacteria that can bioremediate dyes in wastewater

T: Time

- Constructing research objective based on time-frame of research whether it is short-term or long-term project.
- Asking the question of “when?” and “what?”.
 - When is the dateline of the research?
 - What is the duration of the research project?
 - What are the other tasks besides research need to be completed (class, teaching, management etc)?

Example: Biodegradation of Textile Dye by Using isolated-Bacteria from wastewater



Specific Research Objectives

1. To **isolate** bacteria from wastewater
2. To **characterize** bacteria isolated from wastewater.
3. To **study** the biodegradation of textile dye by isolated-bacteria in laboratory.
4. To **investigate** the biodegradation of textile dye by isolated-bacteria in real wastewater.

List of References

- Editorial of Library and Information Science Research (2007), What is Problem Statement?, 29, 307-309.

MY PROFILE



Dr Nik Ahmad Nizam Bin Nik Malek,
BSc (Ind. Chem.)(UTM), MSc (Chem)(UTM), PhD (Chem)(UTM), A.M.I.C

Senior Lecturer,
Department of Biotechnology and Medical Engineering
Faculty of Biosciences and Medical Engineering

Email: niknizam@fbb.utm.my, niknizam@utm.my,

Website: <http://www.staff.blog.utm.my/niknizam/>