



## P.6 Budding Scientists Programme Framework

### OBJECTIVES:

1. To nurture students' intrinsic interests in pursuing further study in science and raise their curiosity over scientific issues
2. To equip students with fundamental knowledge and concepts in Physics and Chemistry for preparing their study of junior and senior secondary science
3. To develop habit of planning and designing experiment for evaluating their hypothesis formulated
4. To develop students' proper skills and techniques in manipulating common apparatuses for accomplishing tasks involved in their designed experiment
5. To develop proper attitudes towards morals and ethics covered in scientific issues
6. To prepare students with sufficient skills for designing and conducting mini-research on their own
7. To prepare students for carrying out mini-research project for participating in territory-wide science competitions

### THEME:

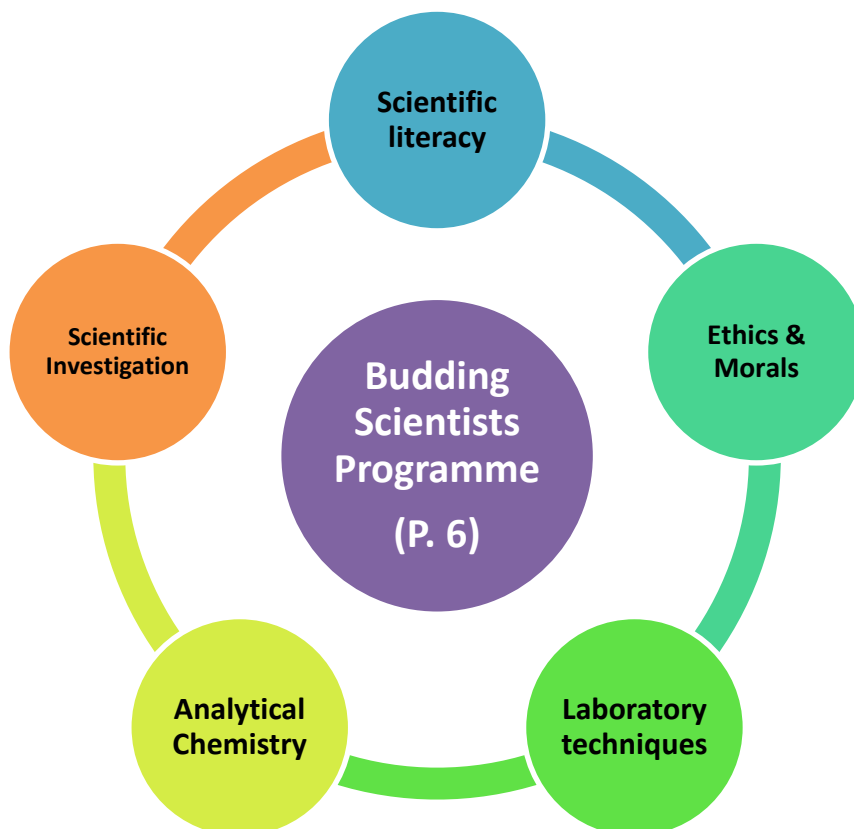
- Analytical Chemistry

### PEDAGOGIES:

- Problem-based Learning (PBL), Peer-learning (Pair-up work)

**SCIENTIFIC ELEMENTS:** Fair Tests, Nature of Science, Scientific Investigation

### KEY ELEMENTS:



### PROGRAM FEATURES:

- This program is designed in four interrelated parts:
  - Part I – Ethics & Morals, Basics of Scientific Investigation**
  - Part II – Physical Properties of Substances**
  - Part III – Chemical Properties of Substances**
  - Part IV – Mini-research Project**
- Lecture and practical work would intertwine during the program

## DETAIL OF TEACHING CONTENTS:

<b>Part I – Ethics &amp; Moral, Basics of Scientific Investigation</b>	L1 Nature of Science, Spirits of Scientists L2 Basic of Scientific Investigation
<b>Part II – Physical Properties of Substances</b>	L3 Physical & Chemical Properties of Substances E1 How to distinguish colourless liquids by physical properties (I)? E2 How to distinguish colourless liquids by physical properties (II)? E3 How to distinguish colourless liquids by physical properties (III)? E4 How to distinguish colourless liquids by physical properties (IV)?
<b>Part III –Chemical Properties of Substances</b>	E5 How to distinguish white powders by chemical properties (I)? E6 How to distinguish white powders by chemical properties (II)? E7 How to distinguish white powders by chemical properties (III)? E8 Practical Test: ‘Identifying unknown powder by using both physical and chemical properties’
<b>Part IV – Mini-research Project</b>	E9 Mini-research Consultation Session I E10 Mini-research Consultation Session I L4 Presentation of Mini-research Project

### **Part I – Ethics & Morals, Basics of Scientific Investigation**

- Discuss ‘Nature of Science’, ‘Spirits of Scientists’ and ‘Basics of Scientific Investigation’

### **Part II – Physical Properties of Substances**

- Introduce the concept of ‘property’, ‘physical property’ and ‘chemical property’ of substances
- Realize the importance of studying properties to Chemists
- Use ‘tap water’, ‘salt water’, ‘alcohol’ and ‘detergent solution’ as examples to study their physical properties (i) on different surfaces and (ii) during mixing with each other
- Identify the unknown liquid given based on the physical properties of the four liquids studied

### **Part III – Chemical Properties of Substances**

- Realize the differences between ‘physical property’ and ‘chemical property’ of substances
- Realize the importance of studying chemical property to Chemists
- Use ‘baking soda’, ‘baking powder’, ‘cream of tartar’ and ‘cornstarch’ as examples to study their chemical properties when subjected to be reacted with four different liquids, namely, ‘water’, ‘vinegar’, ‘fresh red cabbage juice’ and ‘iodine solution’
- A practical test is given to test participants’ ability to identify four different white powder studying the chemical properties acted upon by four different liquids

### **Part IV – Mini-research Project**

- Carry out mini-research which involves simple experimental work to further investigate interesting topics

## REFERENCE:

- The experimental content is designed and modified from ‘Chapter 3: Physical Properties & Physical Change in Liquids’ & ‘Chapter 5: Chemical Change’ of ‘Inquiry in Action’ developed and published by the American Chemistry Society (Webpage: <http://www.inquiryinaction.org/classroomactivities/>)