Computing Science

Based on the Basic Education Curriculum B.E. 2551 (Revised Edition B.E. 2560)

Primary
Education
Smart+
Prathomsuksa

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Lesson Plan

Chapter 1 Solving Problems with Logical Thinking

Duration: 8 hours

STAND 4: Technology

Standard: Sc. 4.2

Indicators: P5/1   Students will be able to solve problems with logical thinking, explain work process and predict the results of uncomplicated problems.

Introduction:

In this chapter, students will learn about logical thinking. They will practice how to use logical thinking to solve different situations in their daily life.

Learning objectives:

Students will be able to:

1. Explain and give examples of the use of logical thinking in daily life.
2. Use logical thinking in solving daily problems.
3. Explain the steps of solving simple problems with logical thinking.
4. Anticipate for the results from solving simple problems.
5. Work with friends in groups to solve problems.
6. Responsible for both group work and personal work.

Key competencies:

1. Thinking capacity
2. Problem–solving capacity
3. Capacity for technological application

Concepts:

- Logical thinking is the process of applying the rules or conditions that cover all cases to consider solutions, working explanation or anticipation for the results.
- The beginning of work in different conditions will give different results.

Teaching/Learning activities:

Start up:

1. Show students a pile of workbooks. Asks each group of students to plan on how to arrange the books.
2. Randomly get some groups to explain their plans.
3. Tell students that in this chapter they will study about logical thinking.

Part 1 Arranging things

1. Referring to the start-up activity, ask students if they manage to find a plan to solve the problem. What do they notice about their plans? They should answer that they have different plans. Some arrange by the sizes, some by the colors and some by the subjects of the books.
2. Ask students if they have thought of arranging them in terms of convenience of getting them or in terms of frequency of usage.
3. Show students a set of six hollow wooden dolls (Matryoshka). Let them examine it for a while. Show them that we can keep the dolls by placing them in each other.
4. Encourage them to watch the video by scanning the QR code in More Videos on page 1. They will know more about the dolls.
5. Then, ask each group to think how to keep the dolls the fastest way. Let them explain step by step. Ask them these questions:
   - Whose plan is the best? Why?
   - Can they do it in other ways?
6. Explain them the connection of the activities of arrangement the wooden dolls and logical thinking. Refer to page 2.
7. Ask students to answer the question in Figure It Out on page 2.
8. Get them to read the information in More Info on page 2.
9. Explain what logical thinking is. Refer to page 3.
10. Give more examples of using logical thinking to solve problems in our daily life. Refer to pages 3 and 4.
11. Ask students to give more examples of using logical thinking in solving problems in our daily life.
12. Assign them to do Hands-on Activity 1 on page 4. Then, ask each group to present their designs and explain their reasons for their designs.

Part 2 Arranging steps to complete a task

1. Referring to the previous Hands-on Activity, tell students that now they will need to write the steps of instructions to arrange the clothes for someone based on their design. How will they do it?
2. Ask them to give their steps of instruction to the group next to them. Can they understand and follow the steps? Let them explain. Get each group to improve their steps based on the comments. Ask them if the results will be same. Why? Why not?
3. Explain that the sequence of steps in completing a task is important. There is a logical explanation behind each step. If we jumble up the sequence, we might get a different result.
4. Use the example on pages 5 and 6 to explain further.
5. Encourage them to answer the question in Figure It Out on page 5.
6. Assign them to do Hands-on Activity 2 on page 7. Then, them to present their ideas.

Part 3 Completing Sudoku

1. Revise the previous topic of logical thinking and solving simple problems.
2. Show students the basic game of Sudoku. Explain its rules and how to play. Refer to pages 7 10.

3. Then, ask them to try a few games.
4. After they have finished their games, ask them to explain what did they do while they were playing the game? Did they use logical thinking to solve the games?
5. Teacher lead students to discuss that We use logical thinking to arrange things, arrange steps in completing a task and solve Sudoku.
6. Choose appropriate activities such as Sudoku online, printable Sudoku, numerical prediction and geometric construction program by data entry for students to practice their logical thinking skills.

Closing:
1. Revise their activities and lead them to discuss what they have learnt. Refer to page 11.
2. Ask them or show them more examples of using logical thinking in solving problems in our daily life such as playing Sudoku game, ordering housework during the holidays and tiding things in the kitchen or bedroom.
3. End the lesson by asking students to do the exercise on pages 11 and 12.

Assessment:
1. Assessing students' cognitive behaviors based on Exercise on pages 11 and 12 (Learning objective 1)
2. Assessing students' problem-solving skills based on the problem-Solving Skill Rubric Score (Learning objectives 2, 3 and 4)

Problem-Solving Skill Rubric Score

Skills	No judgement can be made 0	Need improvement 1	Partially proficient 2	Proficient 3	Advanced 4
Framing the problem	No judgment can be made.	States the problem and/or stated goal(s) or objective(s).	Describes the problem and/or stated goal(s) or objective(s) in own words.	Identifies information necessary to solve the problem.	Determine what prior knowledge will be useful in solving the problem.
Solution finding	No judgment can be made.	Selects a solution that does not overcome the obstacle or constraint. Steps of solution are not clear.	Some steps of solution are clear. Selects a solution that overcomes the obstacle or constraint but is not the most effective solution given the options.	Steps of solution are clear. Selects the solution that is the most effective that overcomes the obstacle or constraint but does not completely explain why it is the most effective of the possible solutions.	Identifies steps of solution clearly. Selects the solution that is the most effective to overcome the obstacle or constraint and accurately explains why it is the most effective of the possible solutions.

3. Assessing students' affective behavior based on the Affective Domain Rubric Score (Learning objectives 5 and 6)

Affective Domain Rubric Score

Behavior	No judgement can be made 0	Need improvement 1	Partially proficient 2	Proficient 3	Advanced 4
Teamwork	No judgment can be made.	Joins a group cooperatively. Listens attentively to members of the group. Contributes to the end product of the group.	Gives input and/or recommendations confidently. Respects differing points of view. Agrees on group priorities, goals and procedures.	Completes assigned tasks in a timely fashion. Helps to build a consensus. Takes an active position in group by speaking for the group. Takes responsibility for end product with other.	Takes an active position in group by assigning tasks and/or speaking for the group. Takes responsibility for end product that reflects the minority as well as the majority conclusions of the group. Encourages and acknowledges the work of other group members.
Responsibility	No judgment can be made.	Always relies on others to complete assignments.	Rarely does work. Needs constant reminders to stay on task.	Usually does the work. Seldom needs reminders to stay on task.	Always does the work without being reminded.

Additional Resources

Sudoku online:

https://www.websudoku.com/

https://sudoku.game/

https://sudoku.com/th

Chapter 2 Conditionals

Duration: 10 hours

STAND 4: Technology

Standard: Sc. 4.2

Indicator: P5/2   Students will be able to design and write a simple computer program with logical thinking, as well as debugging.

Introduction:

In this chapter, students will design computer programs. They will understand variable and conditionals in computing through Scratch. They also need to check their instructions, find errors and debug those programs.

Learning objectives:

Students will be able to:

1. Design a program by writing or drawing a flow chart.
2. Design and write a program while examining all conditions in order to get the right results.
3. Find errors by checking each instruction and when finding the cause, debug it until the program shows the correct results.
4. Work with effort.

Key competencies:

1. Thinking capacity
2. Problem–solving capacity
3. Capacity for technological application

Concepts:

- In computing, variables are places where information is stored and the information can be changed.
- Conditional statements tell a computer to perform different tasks depending if the conditionals are met or not.
- In Scratch, the MOD block gives the remainder of a division operation and the round block rounds a number to its nearest integer.

Teaching/Learning activities:

Start up:

1. Assign students to download Scratch program to their computer. They can do so by scanning the Qr codes on page 14.
2. Review the basic Scratch program and its components.

Part 1 Variables in computing

1. Explain what a variable is in computing and how to create one. Refer to pages 13 to 14.

2. Let them know that they can use more variables to make their program interesting. Refer to pages 15 and 16.

3. Ask them to check if their programs give the desirable results by scanning the QR codes. If they programs do not show the correct result, encourage them to debug on their own first. If still cannot, then ask them to get help from their friends. This will help others to improve their debugging skills too.

4. Assign students to create other variables by themselves and show them in class.

5. Assign students to do Hands-on Activity 1 on page 17. They should debug their programs if the programs do not show the correct results. They may debug with a friend.

Part 2 Conditionals in computing

1. Explain about conditional statements in computing. They are similar to the cause and effect concept. They tell the computer to perform different tasks depending if the conditions are true or false. Refer to page 18.

2. Guide them to build a conditional. Refer to the steps on pages 18 to 20.

3. Assign students to practice more and show their programs in class.

4. Assign students to do Hands-on Activity 2 on page 21 -22. Ask students whose programs do not show the correct result to debug on their own. Ask a friend as the last resort. Finally, explain the program in detail to students to ensure everyone understand.

5. Now, students will need to understand a program whereby the user can key in text instead of numbers. Refer to page 22.

6. Assign students to do Hands-on Activity 3 on page 23. Ask them to scan the QR code if they cannot visualize the result when the program is played. Encourage them to debug by their own first. Explain the program to ensure everyone understand it.

7. Explain the MOD and Round blocks.

8. Explain how to determine odd or even numbers using the MOD block. We can round the number as well. Refer to pages 24 to 26.

9. Assigns students to do Hands-on Activity 4 and 5 on pages 27 and 28.

10. Encourage students to create some simple Mathematics problems using Scratch. Ask others to try the programs. Have a survey to find out the best program.

11. Always encourage them to debug on their own before asking for help.

Closing:

1. Revise and lead them to discuss what they have learnt. Refer to page 29.
2. Use these following questions to discuss:
   - How do we write conditional statements?
   - If the result is not correct, how so we improve it?
   - What is MOD block? How can we use it to solve mathematics problem with Scratch?
3. End the lesson by asking students to do the exercise on pages 29 to 31.

Assessment:

1. Assessing students' cognitive behaviors based on the Exercise on pages 20 to 31 (Learning objectives 1 to 3)
2. Assessing students' affective behavior based on the Affective Domain Rubric Score (Learning objective 4)

Affective Domain Rubric Score

Skill	No judgement can be made 0	Need improvement 1	Partially proficient 2	Proficient 3	Advanced 4
Work with effort	No judgment can be made.	Puts very little effort to the task and is unwilling to accept help from friends or teacher.	Puts some effort to the task and stops working when difficulty arises.	Works on task until it is completed or continues working on task when difficulty arises or solution is not immediately evident.	Works on task until it is completed. Works on task until it is completed or continues working on task when difficulty arises or solution is not immediately evident. Views the difficulties as opportunities to strengthen understanding.

Chapter 3 Data Processing

Duration: 12 hours

STAND 4: Technology

Standard: Sc. 4.2

Indicators: P5/4 4   Students will be able to collect, evaluate and present data and information according to their purposes by using various software or services on the Internet to solve problems in daily life.

Introduction:

In this chapter, students will collect, evaluate and present data by using various of software such as Microsoft excel or other internet service.

Learning objectives:

Students will be able to:

1. Perform some tasks such as accessing and exiting programs, creating creation, saving and opening files using Word Document program, graphic design program and presentation program.
2. Create and save files systematically in order for easy and quick retrieval and searching of files later.
3. Work with effort.

Key competencies:

1. Thinking capacity
2. Problem–solving capacity
3. Capacity for applying life skills
4. Capacity for technological application

Concepts:

- We can use computer software, such as accessing and exiting programs, creating files, saving and opening files which can be done in Word Document program, graphic design program and presentation program.

Teaching/Learning activities:

Start up:

1. Show the Mathematics test scores obtained by students. Then, then ask students these questions:
   - Based on the data (the scores), can we have the average score? What other information can we get?
   - What should we do if we would like to find a particular data or to sort the data?
2. Revise with students the hardware parts of the computers. Ask them how to turn on and turn off a computer.

Part 1 Processing data with Microsoft excel

1.1 Counting

1. Explain that we can collect, evaluate and present data and information based on our purposes by using various software such as Microsoft Excel.
2. Explain how to use COUNT functions in Microsoft Excel to count all data. Refer to pages 32 to 34.
3. You may use data from the start-up activity to do counting in Microsoft Excel or assign students to collect some data by themselves and use them for counting purpose in Microsoft Excel.
4. Assign students to do Hands-on Activity 1 and 2 on page 35.

1.2 Basic arithmetic operations

1. Explain that in Microsoft Excel, we can carry out the basic arithmetic operations such as addition, subtraction, multiplication and division.
2. Demonstrate how to do the basic arithmetic operations with Microsoft Excel. Refer to pages 36 to 39.
3. You may ask students to create some Mathematics problems in Microsoft Excel and others to try them.
4. Assign students to do Hands-on Activity 3 on page 40.

1.3 Sorting and filtering

1. Explain that with Microsoft Excel, we easily sort or reorganize the data.
2. Demonstrate how to sort data. Refer to pages 41 and 42.
3. Assign students to do Hands-on Activity 4 on page 42
4. Explain and demonstrate how to filter the data using Microsoft Excel. Refer to pages 43 and 44.
5. Lead students to discuss the differences between the sorting and filtering functions in Microsoft Excel. Refer to Hands-on Activity 5 on page 45.
6. Test students' understanding of sorting and filtering function in Microsoft Excel by assigning students to do Hands-on Activity 6 on page 45.

Part 2 Stages in data processing

1. Explain the data processing cycle. Refer to pages 46 and 47.
2. Assign students to do Hands-on Activity 7 on page 47. Lead them to discuss the answers.
3. You may use some examples from the previous subtopics such as in 1.2 or 1.3 to explain about data processing so that students understand more.

Closing:

1. Revise and lead them to discuss what they have learnt. Refer to page 48.
2. Use these following questions to discuss:
   - How will you use Microsoft Excel?
   - What are the advantages of using this software?
   - How will you use the data processing cycle?
3. End the lesson by asking students to do the Exercises on page 48 and 49.
4. Teacher assigns students to do exercise on page 48 for assessing their contents.

Assessment:

1. Assessing students' cognitive behavior and processing data skills based on Exercises on page 48 and 49 (Learning objectives 1 and 2)
2. Assessing students' affective behavior based on the Affective Domain Rubric Score (Learning objective 3)

Affective Domain Rubric Score

Behavior	No judgement can be made 0	Need improvement 1	Partially proficient 2	Proficient 3	Advanced 4
Work with effort	No judgment can be made.	Puts very little effort to the task and is unwilling to accept help from friends or teacher.	Puts some effort to the task and stops working when difficulty arises.	Works on task until it is completed or continues working on task when difficulty arises or solution is not immediately evident.	Works on task until it is completed. Works on task until it is completed or continues working on task when difficulty arises or solution is not immediately evident. Views the difficulties as the opportunities to strengthen understanding.

Chapter 4 Internet

Duration: 10 hours

STAND 4: Technology

Standard: Sc. 4.2

Indicators: P5/3 Students will be able to use the Internet in search of information, communication and working together, as well as evaluating information reliability.

P5/5 Students will be able to use information technology carefully and ethically with awareness of their rights, duties and other people's rights. Also, they will be able to inform the person involved when finding inappropriate information or person.

Introduction:

In this chapter, students will learn about the use of the Internet in their daily life. Students will understand that the Internet is a worldwide system of computer network that connects millions of computers. They will understand that we can get benefit from the Internet in the meantime we can also get harm from the Internet as well. Students also should know the way to evaluate reliability of the information obtained from the Internet so that they can avoid the danger.

Learning objectives:

Students will be able to:

1. Use the Internet in search of information, communication and working.
2. Evaluate information reliability.
3. Give examples on how to use information technology carefully and ethically with awareness of their rights, duties and other people's rights.
4. Give examples on how to inform the person involved when finding inappropriate information or person.
5. Work responsibility with friends.

Key competencies:

1. Communication capacity
2. Thinking capacity
3. Capacity for applying life skills
4. Capacity for technological application

Concepts:

- The Internet is very useful. However, there are dangers too if we do not know how to evaluate information reliability.
- We can evaluate information reliability by comparing the consistency of information from different sources, accuracy of information, credibility of the authors and publication dates.
- We need to have good manners when communicating on the Internet, on the other side we need to protect ourselves from online threats.

Teaching/Learning activities:

Start up:

1. Ask students these questions:
   - What is the Internet?
   - Have you ever used the Internet? How often?
   - What is your purpose of using the Internet?
   - Do you think the Internet is useful? Why or why not?
   - Do you think the Internet is dangerous? Why or why not?

Part 1   Uses of the Internet

1.1 Communication

1. Explain to students that the Internet is a worldwide system of computer networks connecting millions of computers.
2. Encourage students to watch the video on More Videos on page 50 by scanning the QR code.
3. Ask each group of students to brainstorm on how we use the Internet to communicate. Then, ask them to present their ideas.
4. Lead to discuss the uses of Internet for communication. We can communicate via emails and social media.
5. Demonstrate how to use an E-mail. Let students to try and send e mails to their friends. Discuss with them the do's and don'ts when we are emailing. Ask them for a reason.
6. You can let students to watch videos of the history of Emails for further understanding.
7. Assign students to do Hands-on Activity 1 on page 53.
8. Explain social media. Ask students if they use social media to communicate.
9. Ask them if they know the difference between instant messaging, voice calls, video calls, video conferencing and blogging. Do they use any of these?
10. Explain the differences. Refer to pages 54 to 57.
11. Ask them to answer the questions in Figure It Out on pages 54, 55 and 57.
12. Encourage them to watch the video about blogging on More Videos on page 56.
13. Assign each group of students to brainstorm about how we should behave when communicating using the Internet. Then, let them present their ideas and have a discussion.

1.2 Commercial

1. Ask students these questions:
   - Do your parents buy things online? Why or why not?
   - What are the advantages and disadvantages of buying things online?
2. Explain the uses of Internet for commercial purposes. Refer to pages 57 and 58.
3. Lead students to discuss about safety when we do online purchasing.
4. Let students to watch some live steaming of commercial in order to have more understanding of what we should be concern of when we are doing live streaming.
5. Teacher asks students whether they know about internet banking. Is it safe? Guide them to answer the question in Figure It Out on page 58.

1.3 Information

1. Explain to students that we can gather a lot of information with the Internet.
2. Guide them to know how to use keywords for searching information.
3. Assign students to search for some information on the Internet such as our population, the height of our tallest mountain and the area of our country.
4. Lead students to discuss what type of information that we could search on the Internet.
5. Assign students to search for some information of a subject and then present their findings in class.

1.4 Entertainment

1. Ask students whether they have watched any movie on the Internet. Why or why not?
2. Let students explain and share their experience of using the Internet for entertainment.
3. Assign students to do Hands-on Activity 2 on page 60.

Part 2 Evaluating information reliability

1. Assign students to search some information. Then ask them whether it is accurate. How do we decide whether it is accurate or not?
2. Explain that it is an important for us to evaluate the reliability of the information effectively. We can do so by comparing the consistency of information from different sources, verifying the sources of information, checking the credibility of the authors and checking the publication dates.
3. You may ask students' opinions on why we have to evaluate the information.
4. Explain more criteria such as the purpose, authority, accuracy, and objectivity. Refer to page 62.
5. Assign students to do Hands-on Activity 3 on page 63. Then, let them present their works.

Part 3 Danger of the Internet

3.1 Cyberbullying

1. Let students watch video clip about cyberbullying. Ask them these questions and discuss:
    *   What do you know about bullying?
    *   What do you know about cyberbullying?
    *   Why is cyberbullying harmful?
    *   Have you experience any cyberbullying?
    *   What should you do if you are being bullied online?
2. Explain more about danger cyberbullying. Refer to pages 64 and 65.
3. Assign each group of students to do Hands-on Activity 4 on page 65. Then, let them present their idea and discuss about them.

3.2 Sexual grooming

1. Let students watch video clip about sexual grooming. Ask them these questions and discuss:
    *   What do you know about sexual grooming?
    *   Why is sexual grooming harmful?
    *   Should we talk to someone online whom we do not know in reality? Why?
    *   Should we meet someone we know online alone? Why?

2. Explain more about sexual grooming. Refer to pages 66 and 67.
3. Assigns each group of students to do Hands-on Activity 5 on pages 67 and 68. Then lead them to discuss.

3.3 Cybercrime
1. Explain cybercrime. Refer to pages 68.
2. For more understanding, you may use a case study for each of group to read and discuss.
3. Assign each group of students to do Hands-on Activity 6 on page 69. Then lead them to discuss.

3.4 Staying safe online
1. Tell students that although the Internet does give us harm, but we can still use it with extra precautions.
2. Discuss with students the ways to stay safe online. Refer to page 70.
3. Assign each group to discuss and share their ideas about how to stay safe online. Get them to present in varieties ways such as poster, writing, or oral presentation.
4. Assigns each group of students to do Hands-on Activity 7 on page 71. Then, lead them to discuss.

Closing:
1. Revise and lead them to discuss what they have learnt. Refer to page 71.
2. Use these questions to discuss:
   - Is every information from the Internet accurate? Why? Why not?
   - What criteria can we use to determine the reliability of the online information?
   - What are the examples of good manners for communication through the Internet?
3. End the lesson by asking students to do the exercise on pages 72 and 73.

Assessment:

1. Assessing students' cognitive behavior based on the Exercises on pages 72 and 73 (Learning objectives 1 to 4)
2. Assessing students' affective behavior based on the Affective Domain Rubric Score (Learning objective 5)

Affective Domain Rubric Score

Behavior	No judgement can be made 0	Need improvement 1	Partially proficient 2	Proficient 3	Advanced 4
Teamwork	No judgment can be made.	Joins a group cooperatively. Listens attentively to members of the group. Contributes to the end product of the group.	Gives input and/or recommendations confidently. Respects differing points of view. Agrees on group priorities, goals and procedures.	Completes assigned tasks in a timely fashion. Helps to build a consensus. Takes an active position in group by speaking for the group. Takes responsibility for end product with others.	Takes an active position in group by assigning tasks and/or speaking for the group. Takes responsibility for end product that reflects the minority as well as the majority conclusions of the group. Encourages and acknowledges the work of other group members.
Responsibility	No judgment can be made.	Always relies on others to complete assignments.	Rarely does work. Needs constant reminders to stay on task.	Usually does the work. Seldom needs reminders to stay on task.	Always does assign work without being reminded

Additional Resources

The history of email. https://www.youtube.com/watch?v=x8ty2pOZ4E4

The history of email evolution. https://www.youtube.com/watch?v=LV_rKAiB8Sc

Cyberbullying https://www.youtube.com/watch?v=peDosNN7l3w

Sexual grooming https://www.youtube.com/watch?v=GOsgQbmvuUQ