# APPENDIX A

**Lesson Plan**

**Mathematics Curriculum to Promote Learning and Innovation Skills of the 21st Century By Open Approach Wiengjedee Wittaya School, The Secondary Educational Service Area Office 35**

Unit 1 Topic: Integers

Activity: Investigating Accounts Period: 9 Date 24 June, 2013

Teacher: Ms. Supapon Saosing

Students: 42 students, M.1/2 Wiengjedee Wittaya School

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**Learning and Innovation Skills; 4C's**

- Critical thinking and problem solving
- Creativity and innovation
- Communication
- Collaboration

**Goal of the Learning Unit**

Learning objective of this unit are to survey the understandings of students about integers and puts emphasis on positive integers, negative integers, integers operations i.e. addition, subtraction, multiplication, and division of positive integers with positive integers, negative integers with negative integers, and positive integers with negative integers as well as characteristics of the integers. Additionally, the aim of this unit is would like to promote learning and innovation skills of the 21st century which are critical thinking and problem solving, creativity and innovation, communication, and collaboration.

**Aim of the Lesson**

1. Students have understanding about negative integers
2. Students can give examples of negative integers from daily life experiences.

**Content of the Lesson**

Negative integers is an integers that is less than zero using a symbol (-) before a number to represent the negative integers such as -3, -5.

**Sequences of learning activities**

**Posing Open-ended Problem (10 minutes)**

1) Teacher greets students, asks them about experiences regarding selling and buying things including documenting expense and income account.

2) Teacher asks students to break into 8 groups, 4-5 students per each and then name a group as a business shop. Teacher presents a problem that "the shop wants to buy things to sell from many shops in Lamphun city, for each group please go to buy things as described in a list given (each group selects and buys from only 4 groups out of 8), and then please record income and expense account. Each shop has 210 baht per group. How could students document income and expense account?"

3) Teacher presents the learning activities as "For each group, students please present your ideas about how to document income and expense account of your own shop".

**Students' self-learning (15 minutes)**

Students from each group go and buy things as listed and do income and expense account. Teacher arouses students to share ideas and discuss it among peers in a group. Each group document idea on a worksheet and prepare for a presentation, teacher goes around observing and recording their ideas as well.

**Whole Class Discussion and Comparison (15 minutes)**

1. Teacher arranges students' ideas in order of sequence, before and after, and by considering of forms of explanations.

2. Teacher chooses a group of students to come out and present in one by one. Then, put a worksheet presented on a presentation paper. Teacher arouses students to listen to peers and ask questions.

3. Teacher chooses ideas which most of students have as the first priority to be presented. After that, teacher asks students which ideas are similar to other groups and which ones are different. Teacher arouses them to find out differences and presents the following issues:

Documenting a number in case that there isn't enough money (expenses more than income), what symbol should be used to represent that number, why this symbol is used in income and expense account.

**Summarization through Connecting of the Students' Mathematical Ideals Emerged in the Classroom (10 minutes)**

1. Have them think about documenting numbers in income and expense account, what forms and elements should be considered. Then, teacher links ideas of students to a conclusion of symbol used to describe expenses more than income.

2**.** Teacher concludes that a representation of a number in case that expenses more than income should be "–" or negative integers as well as asks students where they have seen this negative integers in daily life.

**Learning Materials**

1. Brochures from 8 shops
2. Money (assumedly) 210 baht per each group
3. Thermometers
4. Papers for presentation
5. Worksheets to document income and expense account

**Expected findings**

Students document-10, be in outstanding debts 10 baht, be in deficit 10 baht, and be indebted 10 baht.

**Questions to assess students' understandings**

How students can build up the understanding about meaning of negative integers from a problem given?

**Teaching Log**

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Sign..... Teacher

(Ms. Supapon Saosing)

**Buying List** **Shop's owner**.....

| Name of shop | List | Amount |
|---|---|---|
| A | - Snack: Pocky<br>- Small bucket | 2 items<br>1 item |
| B | - Mixed chocolate and malt power: Milo<br>- Milk powder: Hi-Q3 | 1 pack<br>1 pack |
| C | - Polar Fleece blanket<br>- Sausage bread | 1 item<br>1 pack |
| D | - Sunlight<br>-D-nee | 1 pack<br>1 bag |
| E | -Clothes hanger<br>- Snack: Taro | 1 loop<br>4 bags |
| F | - Candy: Heartbeat<br>- Orange juice: Sunquick | 2 packs<br>1 bottle |
| G | - Eggs: CP<br>-Wall clock | 1 pack<br>1 item |
| H | -Toothpaste: Colgate<br>- File: Elephant | 1 item<br>1 item |

*Note: select and buy only 4 shops*

**Income and expense account of the shop**

| Description | Receive | Spend | Balance |
|---|---|---|---|
| | | | |



**Instruction:** For each group, students please present your ideas about how to document income and expense account of your own shop.

Ideas:

# APPENDIX B

## The focus group meeting minutes

**Date**..... .....**Meeting Time**.....**Room**.....

**Objectives** .....**Focus group No**.....

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**Name of participants**

1). .....2).....

3). .....4).....

5). .....6).....

7). .....8).....

9). .....10).....

11). .....12).....

13). .....14).....

**Meeting contents**

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Sign .....

Meeting recorder

**The 21st century skills performance observation form (type1)**

**Observer.....Date.....Time.....**

| **Critical Thinking and Problem Solving;** $C_1$ | **Student's behavior** |
|---|---|
| • Verbal and Written Reasoning<br>• The Propensity to Seek Reason<br>• Inquisitiveness in Open-ended Problem<br>• Making Decision in Solving Problem<br>• Interpreting and Explaining<br>• Making Another Choice and Convincing Others with Appropriate Reasons<br>• Engaging in Analyzing Each Other's Answer<br>• Solving Open-ended Problem<br>• Analyzing Arguments, Claims, or Evidence. | |
| **Creativity and Innovation;** $C_2$<br>• Generating ideas, Often by Thinking Divergently Using Fluency and Originality<br>• Being Tolerant of Ambiguity<br>• Willing to Take Intellectual Risks<br>• Generating New and Varied ideas<br>• Expressing Different Ideas<br>• Generating Learning Style or Tools | |

| | |
|---|---|
| **Communication;** $C_3$<br>• Rephrasing Other's Explanation<br>• Engaging in Question and Discussion<br>• Paying Attention to Others' Reasons<br>• Effectively Communicating Math Concepts Orally and in Writing<br>• Selecting Appropriate Reading Strategies for Open-ended Problems | **Student's behavior** |
| **Collaboration;** $C_4$<br>• Being Able to Express Math Problems with Peers and Teachers<br>• Having Sense of Team Work<br>• Sharing Ideas and Listening to Others' Perspectives<br>• Negotiating to Get Consent | |

**The 21st century skills performance observation form (type 2)**

**Observer.....Date.....Time.....**

**Student's behavior**

**Posing Open-ended Problem (10 minutes)**

**Students' Self-Learning (15 minutes)**

**Whole Class Discussion and Comparison (15 minutes)**

**Summarization through Connecting the Students' Mathematical Ideals Emerged in the Classroom (10 minute)**

**The 21st century skills performance observation form (type 3)**

**Observer.....Date.....Time.....**

| Open Approach Process | Student ‘s behaviors | The 21st Century skills performance |
|---|---|---|
| Posing Open-ended Problem | | |
| Students’ Self-Learning | | |
| Whole Class Discussion and Comparison | | |
| Summarization through Connecting the Students' Mathematical Ideals Emerged in the Classroom | | |

**The framework for student's evaluation about the 21st Century Skills Performance (Learning and Innovation Skills; 4C's)**

Critical Thinking and Problem Solving; $C_1$

- Verbal and Written Reasoning
- The Propensity to Seek Reason
- Inquisitiveness in Open-ended Problem
- Making Decision in Solving Problem
- Interpreting and Explaining
- Making Another Choice and Convincing Others with Appropriate Reasons
- Engaging in Analyzing Each Other's Answer
- Solving Open-ended Problem
- Analyzing Arguments, Claims, or Evidence.

Creativity and Innovation; $C_2$

- Generating ideas, Often by Thinking Divergently Using Fluency and Originality
- Being Tolerant of Ambiguity
- Willing to Take Intellectual Risks
- Generating New and Varied ideas
- Expressing Different Ideas
- Generating Learning Style or Tools



Communication; $C_3$

- Rephrasing Other's Explanation
- Engaging in Question and Discussion
- Paying Attention to Others' Reasons
- Effectively Communicating Math Concepts Orally and in Writing
- Selecting Appropriate Reading Strategies for Open-ended Problems

Collaboration; $C_4$

- Being Able to Express Math Problems with Peers and Teachers
- Having Sense of Team Work
- Sharing Ideas and Listening to Others' Perspectives
- Negotiating to Get Consent

# CURRICULUM VITAE

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|---|---|---|
| Author's Name | Ms. Supapon Saosing | |
| Date/Year of Birth | 29 January, 1982 | |
| Place of Birth | Chiang Mai Province, Thailand | |
| Education | 2001 | Bachelor Degree in Mathematics (Minor in Computer science). Faculty of Science, Chiang Mai University |
| | 2005 | Diploma of Educational Profession, Faculty of Education, Chiang Mai University |
| | 2006 | Master Degree in Mathematics Education, Faculty of Education, Chiang Mai University |
| Scholarship | 2001-2006 | Scholarship under the Institute for the Promotion of Teaching Science and Technology (IPST) |
| | 2011-2013 | Scholarship under the Institute for the Promotion of Teaching Science and Technology (IPST) |
| Experience | Government teacher in Weingjedee Wittaya School, Lamphun Province. The Secondary Educational Service Area Office 35. | |