



The Use of Two-Tier Diagnostic Test to Explore Environmental Literacy

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Presentation agenda

- ❖ Introduction
- ❖ Objective
- ❖ Method
- ❖ Result
- ❖ Conclusion

Introduction

- Environmental problems become more serious around our world.
- The main cause of these problems are from human activities, which is people lack of an environmental literacy.
- In some countries like US, they have environmental literacy plans (ELPs) for developing environmental literacy citizens.

Introduction

- There are several research developed the instrument to evaluate environmental literacy. (Negev, M. et al.,2008; McBeth, B. et al., 2008; Erdogan, M.,2009)
- Those instruments are multiple choice test and rating scale questionnaires.
- In this study developed two-tier test to evaluate environmental literacy

Objective

- To investigate environmental literacy levels in middle school students using a two-tier diagnostic test
- To identify the relationship between environmental knowledge and ethics

Method

Developing Instrument

Analyzed science curriculum standards and contents



**Define environmental literacy in two dimensions
(environmental knowledge and ethics)**

Method

Environmental knowledge

environmental knowledge

knowledge of
environmental issues

socio-political knowledge

Environmental ethics

environmental values

environmental sensitivity and
participation

analyze and evaluate effect of
human activities toward natural
environment

environmental behavior

human responsibility towards
natural environment

Method

Developing Instrument (1st Version)

**45 items of two-tier diagnostic test items
(1st tier was a MCQ, 2nd tier is a short answer)**



Pilot with 29 middle school students

Example

27. ระบบนิเวศสระน้ำแห่งหนึ่งมีการสะสมสิ่งปนเปื้อนจากสารกำจัดศัตรูพืช สิ่งมีชีวิตชนิดใดมีการสะสมสิ่งปนเปื้อนมากที่สุด

ก. นกที่กินปลา

ข. พืชน้ำ

ค. ปลาที่กินพืชน้ำ

ง. ปู

เหตุผลที่เลือกข้อ V คือ เพราะ พืชน้ำจะดูดซับสารพิษจากดินในน้ำ และสัตว์ในน้ำก็จะต้องดูดซับน้ำปนเปื้อนจากน้ำด้วย

What is the living thing that has a most contaminant in chemicals contaminate pond?

A) Bird

B) Plant

C) Fish

D) Crab

Reason:

Method

Developing Instrument (2nd Version)

**Second draft (45 items)
(Both 1st and 2nd tier were a MCQ)**

8. ระบบนิเวศสระน้ำแห่งหนึ่งมีการสะสมสิ่งปนเปื้อนจากสารกำจัดศัตรูพืช สิ่งมีชีวิตชนิดใดมีการสะสมสิ่งปนเปื้อนมากที่สุด

- ก. พืชน้ำ
- ข. ปลาที่กินพืชน้ำ
- ค. ปูที่กินลูกปลาในสระ
- ง. นกที่กินปลาในสระ

เหตุผล

1. สิ่งมีชีวิตที่สัมผัสกับสารเคมีโดยตรงจะมีการปนเปื้อนมากที่สุด
2. สิ่งมีชีวิตในลำดับแรกของห่วงโซ่อาหารจะได้รับสารเคมีมากที่สุด
3. สารเคมีจะสะสมและถ่ายทอดไปยังสิ่งมีชีวิตในห่วงโซ่อาหารไปเรื่อย ๆ

Method

A test was evaluated by three experts



The Final draft of environmental literacy instrument consisted of 32 items

Method

Participants

- 121 middle school students in an industry estate area

Data Collection and Data Analysis

- Descriptive analysis and Pearson's correlation
- The reliability of the instrument was 0.67

Method

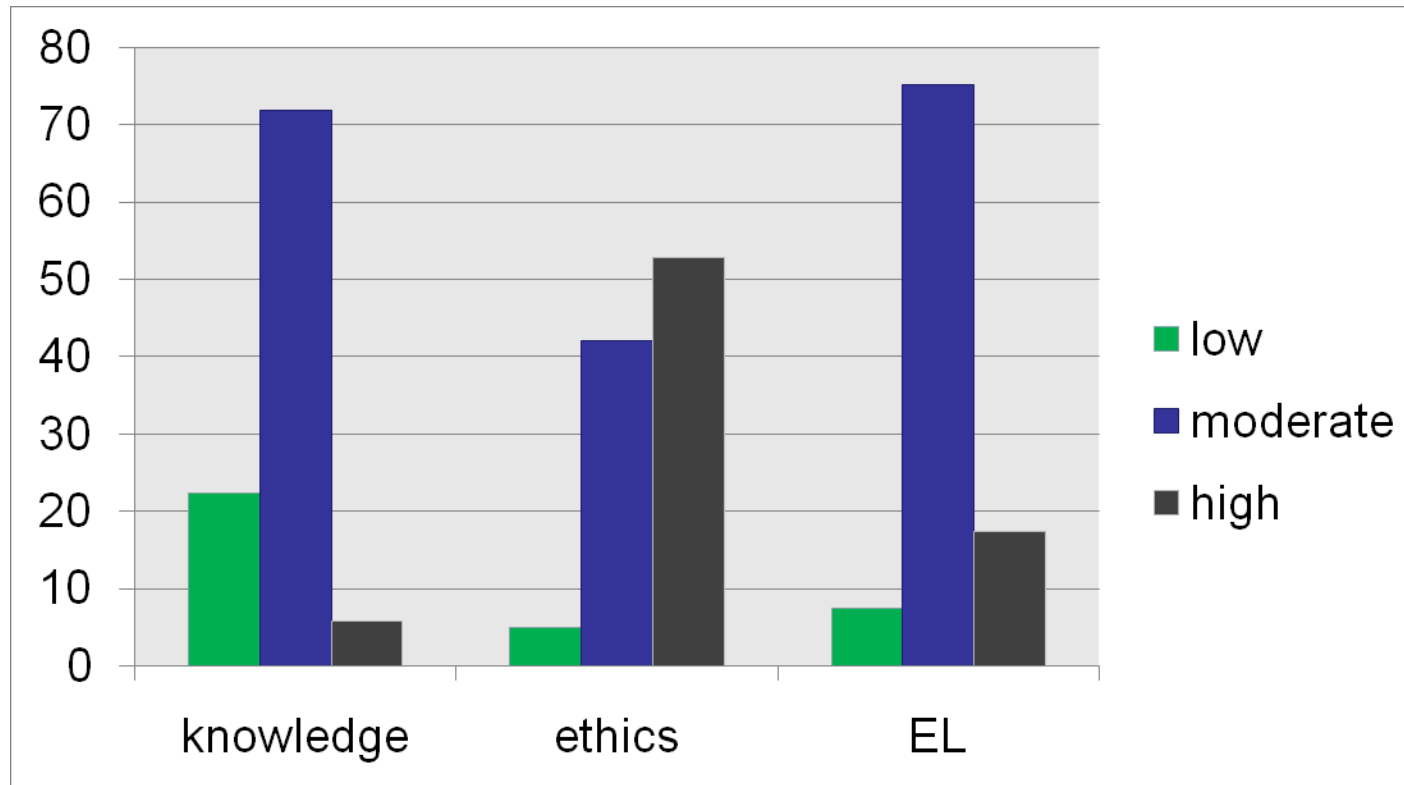
Table 1 Level of environmental literacy

EL	Low	Moderate	High
Knowledge	0-7	8-14	15-22
Ethics	0-3	4-7	8-10
Total	0-10	11-20	21-32

Result

Figure 1 The number of students in each level of environmental literacy

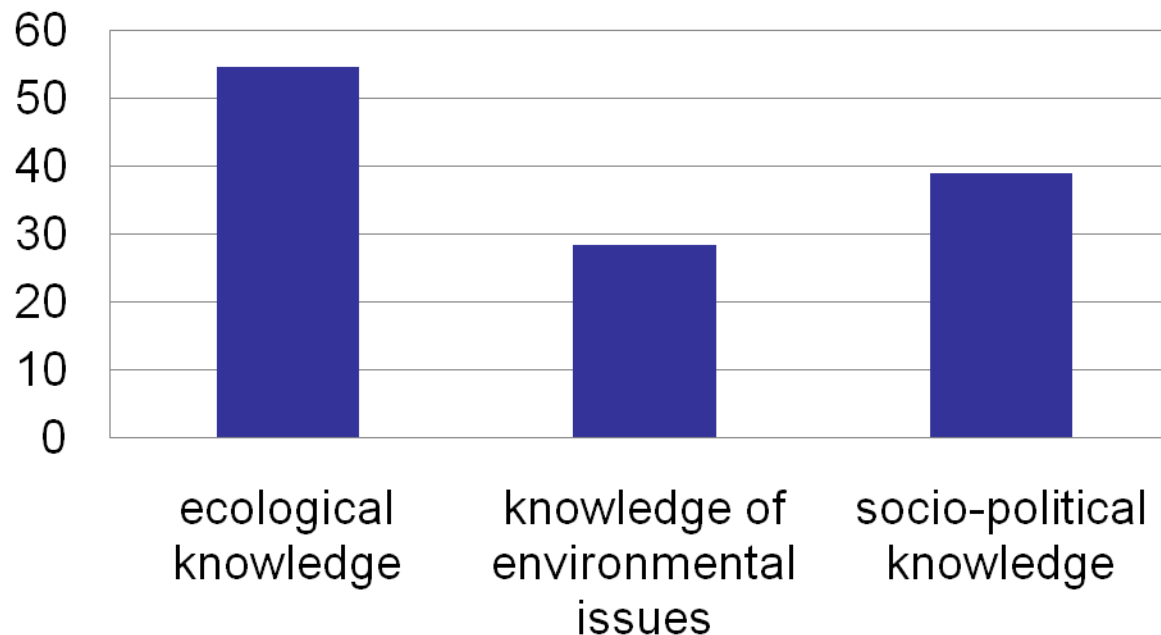
Number of students (%)



Result

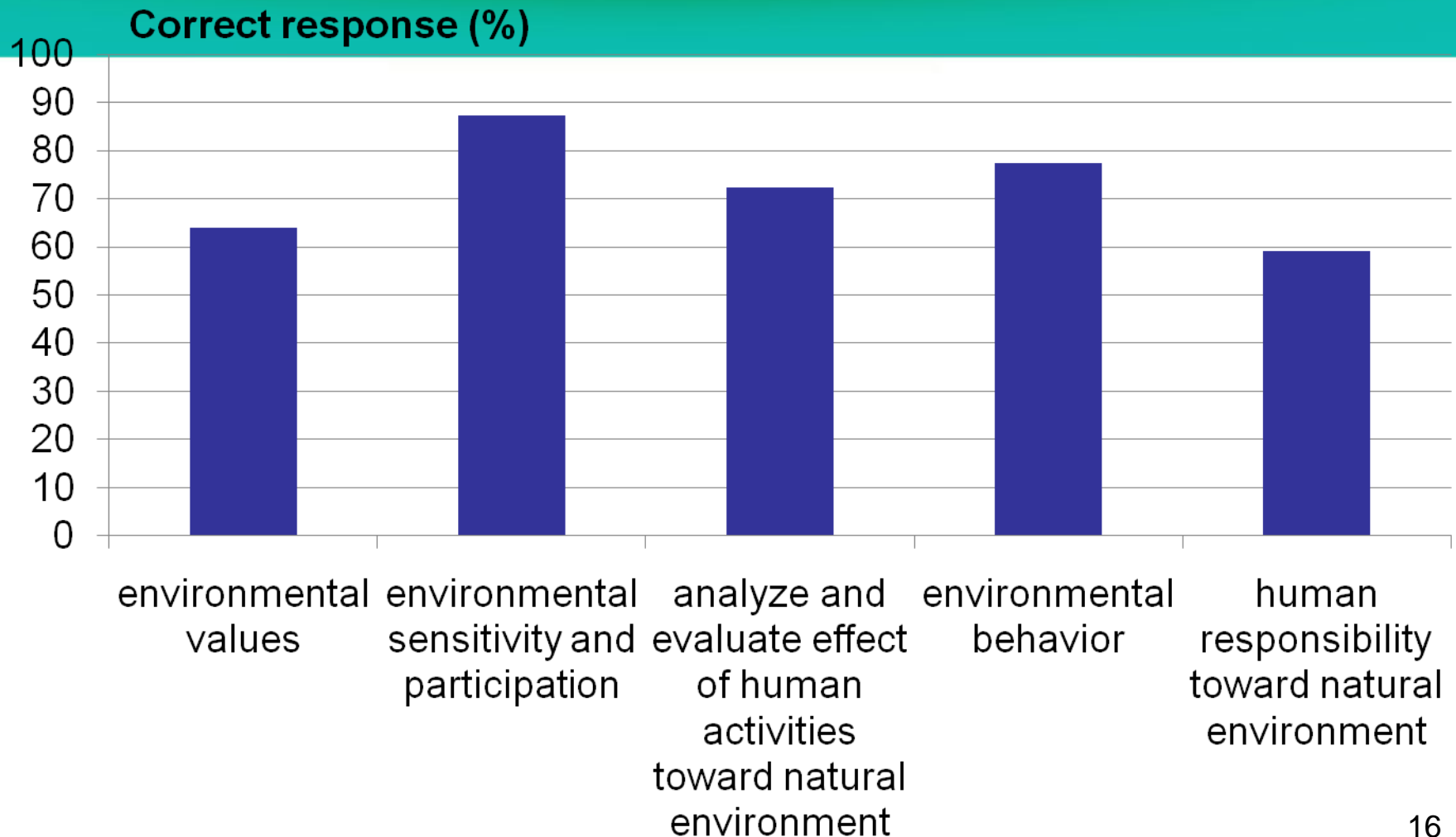
Figure 2 Number of correct response in each component of environmental knowledge

Correct response (%)



Result

Figure 3 Number of correct response in each component of environmental ethics



Result

Table 2 The correlation of environmental knowledge and ethics

Correlation	r	p
Knowledge and ethics	. 378**	.00

** $p < .01$

Conclusion

- The two-tier diagnostic test are able to use for evaluating environmental literacy of the students both knowledge and ethic dimensions.
- Students were at moderate level of environmental literacy;
 - Moderate level of environmental knowledge
 - High level of environmental ethics

Conclusion

- In environmental knowledge dimension
 - Highest component: ecology
 - Lowest component: environmental issues
- In environmental ethics dimension
 - Over 50% in all components.
 - Highest component: environmental sensitivity and participation
 - Lowest component: human responsibility toward natural environment

Conclusion

- There was weak correlation between environmental knowledge and environmental ethics (.378)

Implication

- Knowledge of environmental issues is needed to be taken in environmental education.
- Educators can use the two-tier environmental test to explore their participants level of environmental literacy both knowledge and ethics dimension.

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Thank you
Q & A