Teaching Information Literacy and Reading Strategies in Fourth-Grade Science Curriculum with Inquiry Learning

Lin Ching Chen

Department of E-learning Design & Management,
National Chiayi University, Taiwan.
lingin@mail.ncyu.edu.tw

Introduction

- Taiwanese fourth graders ranked 22 and 9 among 45 and 49 countries and regions in 2006 PIRLS and 2011 PIRLS respectively.
- Their interest in reading ranked low.
- More effective instructional strategies should be investigated and designed for enhancing students' reading literacy.

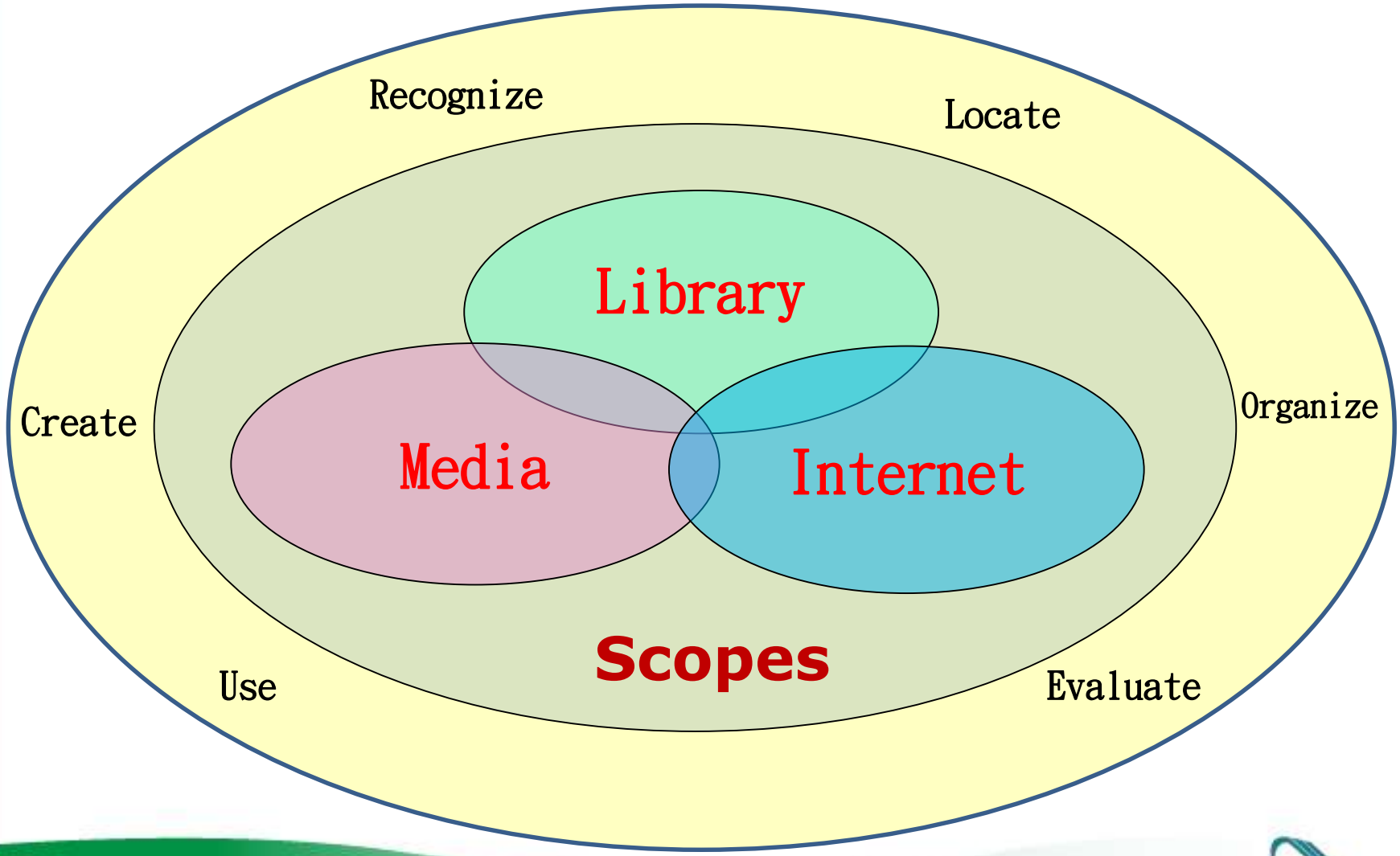
Introduction

- Reading literacy is a part of information literacy and both of them should be integrated across the contexts of school curriculum through inquiry-based learning (Chu, Tse, Loh & Chow, 2011; Kuhlthau, Maniotes & Caspari, 2007)
- Information literacy has two facets: inquiry process and scopes. The inquiry process facet includes the abilities and attitudes to recognize, locate, organize, evaluate, use and create the needed information

Introduction

- The scopes of information literacy refer to multiple literacies, such as library, media, and internet literacies; however, reading literacy is still the basis of information literacy.
- The essence of PIRLS is similar to the library literacy, which both highlight deep understanding of reading materials.

Process & Scopes of IL

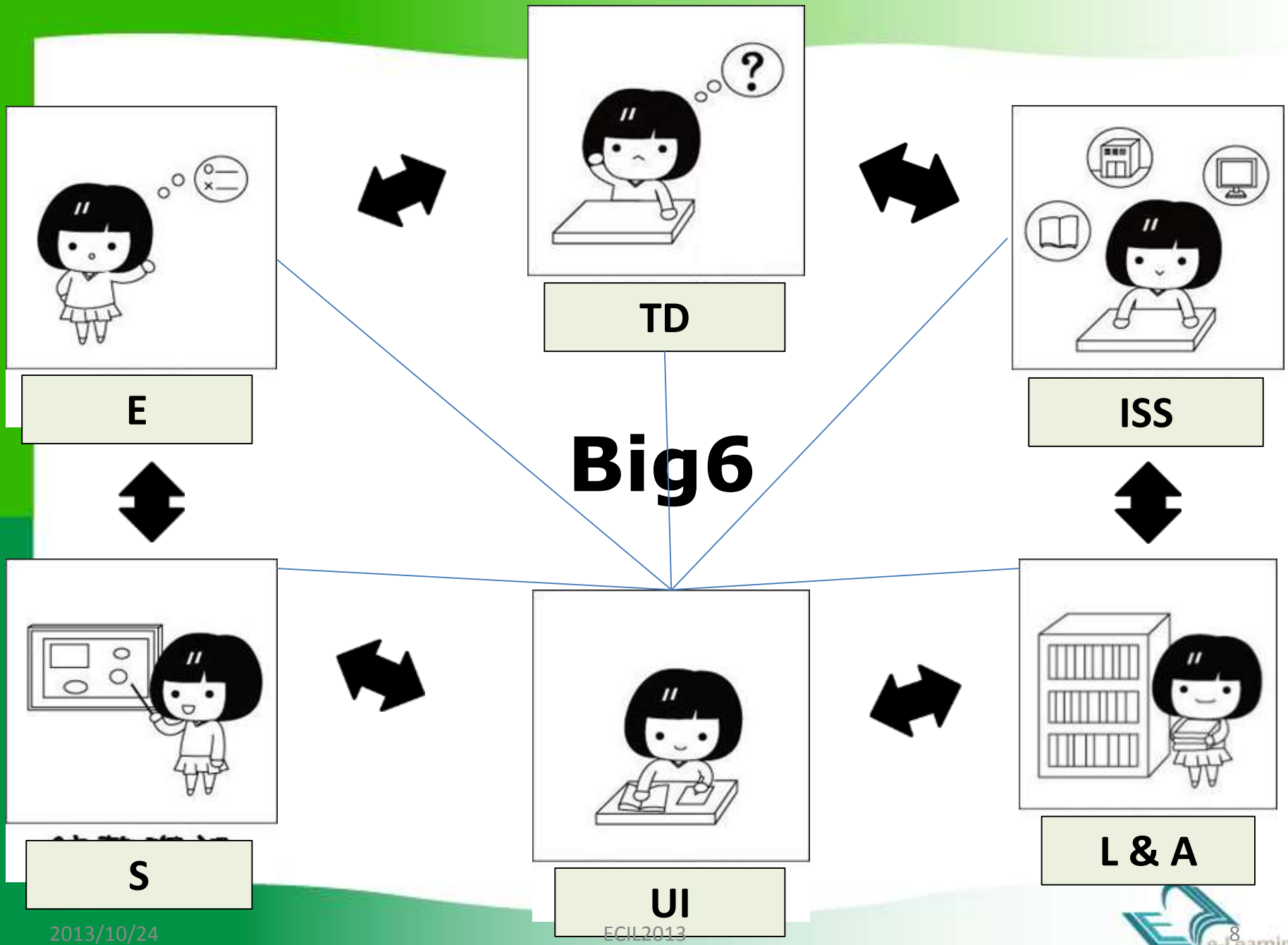


Introduction

- Many studies found that reading literacy should be taught across school curriculum through inquiry-based learning (Eisenberg, Lowe & Spitzer, 2004; Grassian & Kaplowitz, 2009; Harada & Yoshina, 2004).

Introduction

- Big6 model is one of the inquiry model designed by Eisenberg & Berkowitz (2000).
  1. Task definition (TD)
  2. Information Seeking Strategy (ISS)
  3. Location & Access (L & A)
  4. Use of Information (U)
  5. Synthesis (S)
  6. Evaluation (E)


Big6
TD
E
ISS
S
UI
L & A

Introduction

- Limited numbers of empirical studies so far have investigated Big6 inquiry process and effects on students' achievement in subject areas.

Research purposes

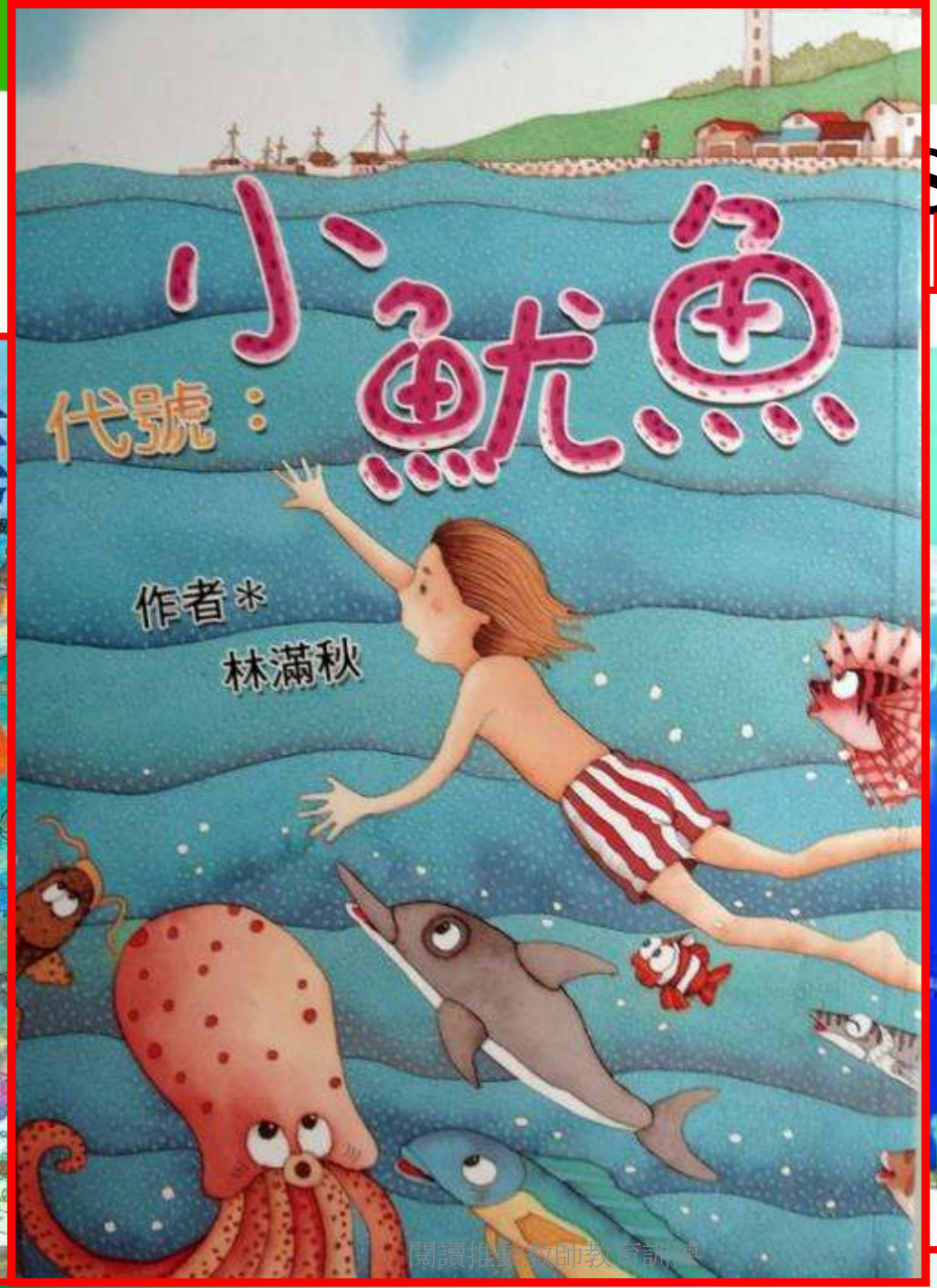
- The purpose of this study was to investigate the effects of inquiry-based curriculum with infusion of reading strategies on students' information literacy and science learning.

Methods

- **Research design:** a mixed methods case study using both qualitative and quantitative methods.
- **Site & Participants:** an elementary school in Taiwan, 28 fourth-grade students (14 boys and 14 girls), having a little inquiry experiences, a media specialist (Ms. Shen, teaching IL), the homeroom teacher (Ms. Chang, teaching reading strategies)

Methods

- **Instructional Content:**
  - the unit of *The Aquatic Creatures* in the fourth-grade science textbook
  - The inquiry theme "*An aquarium in our classroom*" was designed based on the Big6 model
  - teachers as a facilitator who encouraged students and provided support in proposal preparation and aquarium setup.
  - reading six books about aquatic creatures including informational and literary texts


代號：小魷魚
作者＊
林滿秋

Methods

Research Instruments

- Reading comprehension test: designed by PIRLS, titled *Antarctica: Land of Ice*, KR-20= 0.86
- Science test: 27 multiple-choice questions, designed by the researcher, measuring students' recall of the learned science knowledge, KR-20=0.83.

Methods

- **Data Collection**: interviews, participant observations, tests, and documents
- **Data Analysis**: the qualitative data were organized, coded, reviewed and analyzed multiple times; the test data were analyzed using a *t* test.

Discussion & Posing questions

Using internet

Interviewing experts

Designing an aquarium proposal

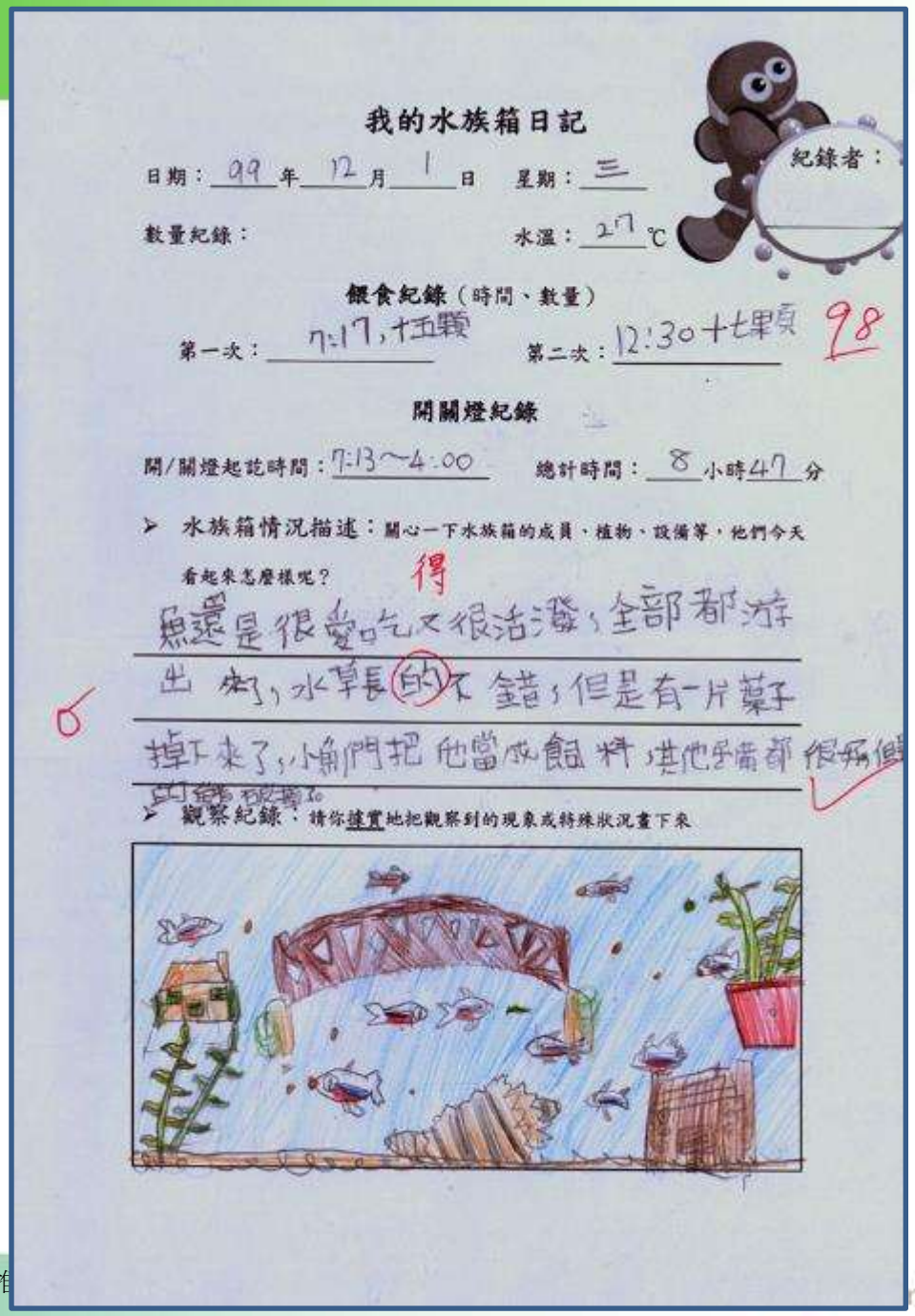
Reporting their proposal

Classroom aquarium

Aquarium journal

Scientific Journal

- Feeding time
- Aquarium description
- Scientific drawing



我的水族箱日記

紀錄者：

日期：99 年 12 月 1 日 星期：三

數量紀錄：

水溫：27 ℃

餵食紀錄（時間、數量）

第一次：7:17，五顆 第二次：12:30十七顆 98

開關燈紀錄

開/關燈起訖時間：7:13～4:00 總計時間：8 小時47 分

➢ 水族箱情況描述：關心一下水族箱的成員、植物、設備等，他們今天看起來怎麼樣呢？

魚還是很愛吃又很活潑，全部都游出來，水草長的不錯，但是有一片葉子掉下來了，小魚們把他當成飼料，其他部都很好。

➢ 觀察紀錄：請你據實地把觀察到的現象或特殊狀況畫下來

Aquarium journal

Literary Writing

- To our fish
- Aquarium Fantasia
- Reminders

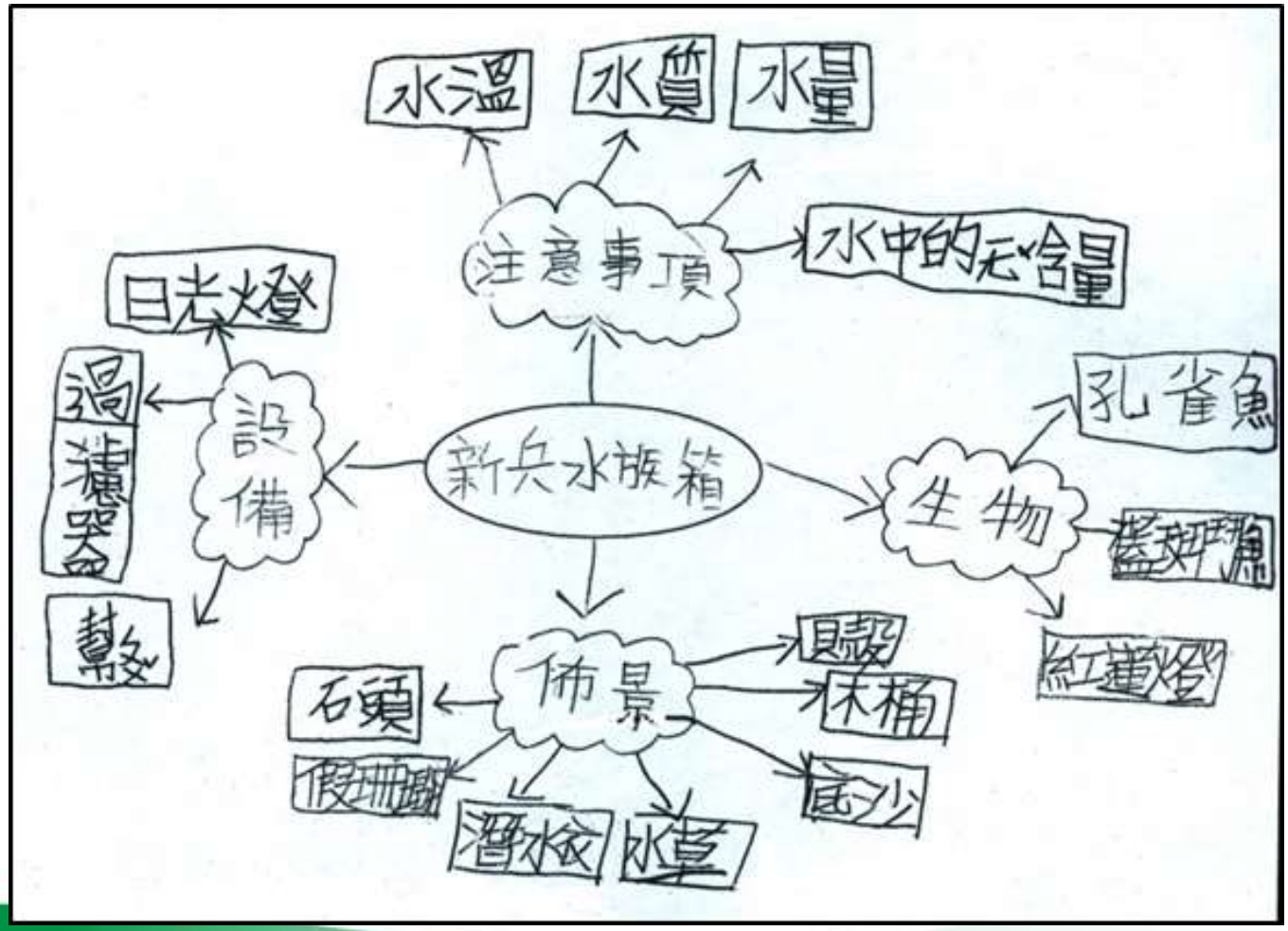
Research Results

1. Student Performance in Information Literacy

--Task Definition

- All of the 6 groups were able to develop a concept map for their aquariums.
- Half of the groups knew how to use different shapes and colors to represent sub-concepts in the concept maps.
- 16 students were able to pose further inquiries after reading the six assigned books on aquatic creatures. Only three groups were able to pose both conceptual and factual inquiries, while questions the other three groups raised mostly were factual ones.

Concept Map


新兵水族箱
注意事項
水溫
水質
水量
水中的元冷量
設備
日光燈
過濾器
敷
生物
孔雀魚
紅蓮燈
佈景
石頭
貝殼
木桶
假珊瑚
潛水夫
水草

Research Results

--ISS, I & A

- Reviewing the final aquarium proposals of six groups, various information sources were used, including 32 items from books, 20 items from webs, and 4 items from databases.
- Most of the students understood the structure of library books' call numbers and found the books they needed.
- Their web browsing skill was less effective than book browsing due to the distraction of hyperlinks on web pages.

Research Results

--Use of Information

- According to students' interviews, they were all satisfied with the improvements they made in reading strategies.
- The within-subjects *t*-test was significant (t=5.572, p=.00 < .05). It showed that fourth graders' reading comprehension skills improved during the inquiry learning.

Research Results

--Synthesis

- The information in the aquarium proposals was succinct and concise.
- The students needed to be often reminded to extract the needed information and make inferences; otherwise, they were still used to copy all of the information they found.

The best proposal chosen

Research Results

--Evaluation

- They most reflected upon their information search process such as having arguments with classmates (6 students), lacking patience in search processes (4 students), information recorded incomplete (3 students), and oral volume too low (3 students).
- Both teachers considered students' reflections were insufficient and less insightful.

Research Results

2. Student Performance in Science Knowledge

- Students acquired the basic science knowledge on marine life after the inquiry-based instruction.

Pretest		Posttest		t	p
M	SD	M	SD		
20.321	4.627	25.214	2.200	6.162	.000

Discussion

- Information literacy and reading strategies can be integrated into fourth-grade science instruction using the Big6 model.
- Both information literacy skills and subject knowledge were enhanced. The study result is consistent with previous research (Fang & Wei, 2010; Harada & Yoshina, 2004; Kuhlthau, Maniotes & Caspari, 2007)

Discussion

- Only half of the students posed higher-order questions. Callison (2009) and Wilhelm (2007) suggest that the first step in inquiry is stating one's own questions which had better be focused, insightful, and higher-ordered ones. Thus, children in Taiwan should be encouraged to pose more sophisticated questions that call for higher-level thinking.

Discussion

- This study verifies prior research findings that inquiry learning provides a meaningful context for students to enjoy reading and practice reading strategies .
- The instructors offer students more opportunities to practice on the skills in different disciplines.

Discussion

- The inquiry-based learning help students learn both the problem-solving process and subject matter.

Time for Questions