

Scientific Writing Heuristic on Project-Based Learning

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Scientific Education Safari



Using Science Writing
Heuristic

on Project-Based Learning

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Background

- Due to technology development and flow, the world has become knowledge economic bases with a focus on intellectual ability and creativity.
- **Creativity** education plays an important role in helping students meet the unpredictable demands of the future.
(NACCCE, 1999)

- **Two criteria for creativity in science course:**

1. It should be based on what 'real' scientists do.

2. It devise a framework suitable to students' needs and abilities.

(Kind, P. M. &Kind,V.,2007)

A lot of investments have been made in many countries for promoting the students' science learning, and encourage the teachers to use the the **scientific inquiry** in the classrooms.

(Minner, D. D., Levy A. J., Century, J. ,2010)

From the learner's perspective, the core components of the essential features of classroom inquiry is as follows:

- Learners are engaged by scientifically oriented questions.
- Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions.
- Learners Formulate explanations from evidence to address scientifically oriented questions.

- Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding.
- Learners communicate and justify their proposed explanations.
(NRC,2000)
- Learners design and conduct investigations.

(NRC,1996)

During the inquiry process, many of students meet the difficulties:

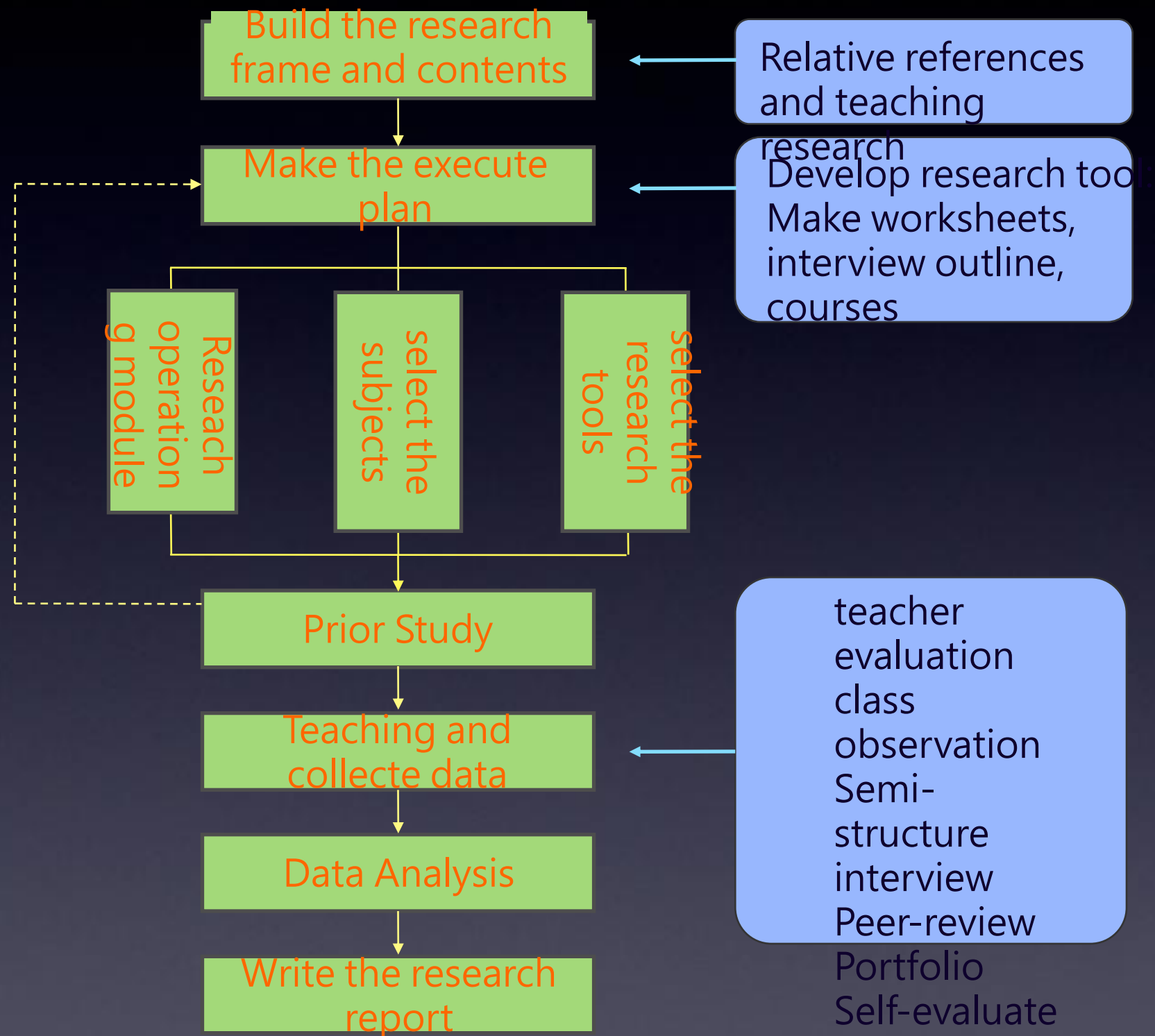
- not able to have the proper scientific driving questions
- not able to control variables
- not able to distinguish relevant evidence from experiment data
- not able to develop a logical argument when they engaged in inquiry activities

(Wu, P. H., Chang, Y. Y., Wu, H.K.,2010)

Research Aim

1. Discussion about the inquiry scientific curriculum teaching and learning.
2. Investigate the scientific creativity development and enhancement.

Research Flow Chart



Literature Review

- Scientific Writing Heuristic
- Project-based Learning
- Scientific Creativity

The importance of Writing

- Writing is viewed as an epistemological tool in the science classroom.

(McDermott, M.A., Hand, B., 2010)

- The writing process is not only for leaning or acquiring knowledge, but for clarifying ideas and constructing knowledge.

(Rivard, L.P., 1994)

The role of writing

1. Enhance students use cognition strategy
2. Create learner-centered learning environment.
3. As the interface of the teacher and students' interactive communication.
4. Improve the students' scientific reasoning
5. Promote the scientific concept development.

(Hu, R. P. &

SWH

The Science Writing Heuristic I

A plan for teacher-designed activities to promote laboratory understanding

- Exploration of pre-instruction understanding through individual or group concept mapping.
- Pre-laboratory activities, including informal writing, making observations, brainstorming, and posing questions.

- Participation in laboratory activity.
- Negotiation phase I- writing personal meanings for laboratory activity. (for example, writing journals)
- Negotiation Phase II- sharing and comparing data interpretations in small groups. (for example, making group charts)

- Negotiation Phase III- comparing science ideas to text books for other printed resources.(for example, writing group notes in response to focus questions)
- Negotiation Phase IV- individual reflection and writing. (for example, creating a presentation such as a poster or report for a large audience)
- Exploration of post-instruction understanding through concept mapping.

- **The Science Writing Heuristic II**

A plan for students

- Beginning ideas- What are my questions?
- Tests- What did I do?
- Observations- What did I see?
- Claims- What can I claim?

- Evidence- How do I know?
- Why am I making these claims?
- Reading- How do my ideas compare with others' ideas?
- Reflection- How have my ideas changed?

(Lori Norton-Meier, Brain Hand, Lynn Hockenberry & Kim Wise, 2008)

Five main elements in developing writing-to-learn tasks:

- Topic: the particular science concept under study
- Type: the specific writing product called for
- Audience: the authentic group written to
- Method of text production : the mode of creating text
- Purpose: the specific curricular goal of the activity

(Prain and Hand, 1996)

Project-based Learning Curriculum

- Base on the Constructivism.
- The Structure includes driving question , design , complete the work and using the technology as the cognition tools.
(Blumenfeld, Soloway, Krajcik, Guzdial, & Palincsar , 1991)

Driving Question

- Feasible
- Worthwhile
- Contextualized
- Meaningful
- Ethical
- Sustainable

(Krajcik , Blumenfeld , Marx,& Soloway,
1994)

An important reason that student cannot develop superior inquiry questions is that the students cannot find the nature and the linkage of the questions. Students are usually eager to get the answers so they stop finding other questions and extending the thinking.

(Gallas, 1995)

Scientific Creativity

- Formulating **a good question** needs creativity. It is the core of doing science, moreover, it is an important part of meaningful learning in scientific inquiry.

(Chin & Osborne, 2008)

- A creative scientist can create **good questions** and choose the best one, then try to find the best solution to solve it.

(Zuckerman, 1992)

Research Design

- Methodology: interpretive study
- Subjects: Total of 120 children participated in this study. four 5th grade classes in an metropolitan elementary school were involved.
- Two different scientific topic courses : One is about acid-base solution, the other is on animal. Two courses is covered across eight weeks. Five students in a group and three times once a week, each class is forty minutes.

- Data sources were observation journal, students artifacts and in-depth interviews about students' involvement, cooperation, understanding, opinions, and perceptions.
- The analytical structures are according to the driving question characteristics (Krajcik et al., 1994) . The students' works are analyzed by the researchers. The interview data was compared and integrated by the researchers.

Expect Results

According to the results, we can propose some suggestions as the reference of scientific creativity teaching and research.

Thanks for your attention
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