Autonomous Learning Behavior in Informal Science Learning

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2017.05.06

Introduction

STEM VS Taiwan

- For learners of science and engineering, it is important to study a wide field of subject and STEM learning.
- Taiwan is also prepared new course program, in the field of science and technology courses, include STEM core idea of cross-cuting.
- The Taiwan education system hasn't curriculum to train young engineers of junior hight school.

Introduction

Autonomous learning

- A keyword of Taiwan's future education is "autonomous learning".
- We think hand-on inquiry-based learning is effective for autonomous learning in K-12 education.
- Autonomous Learning helps the students actively learn problem-solving methods.

Theoretical Background

Self-regulated Learning，SRL

- Lately, people from both academic and government sectors have keenly promoted self-regulated learning (SRL) because they recognize the need to help learners take charge of their own education.

Theoretical Background

Self-regulated Learning · SRL

- While there are various explanations and studies that focus on the definition of SRL, it can be simply described as a learning process with four attributes（Schunk & Zimmerman, 1994）: intrinsically or self-motivated, planned or automatized, self-aware of performance outcomes and environmentally/socially sensitive and resourceful.

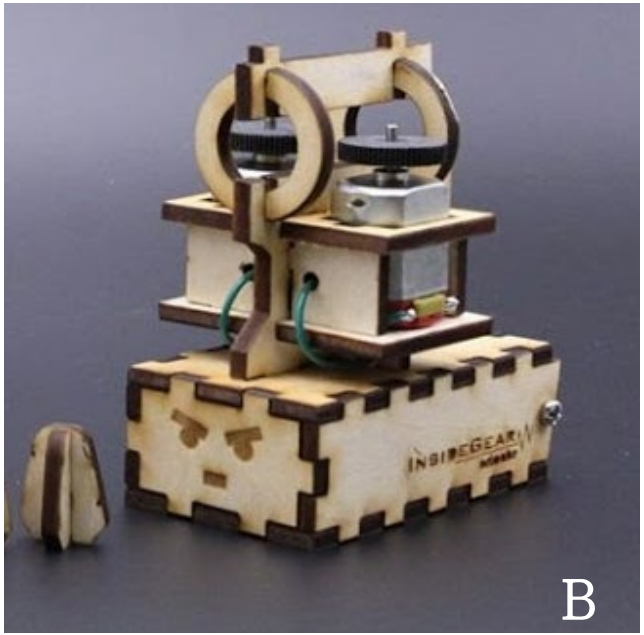
Theoretical Background

Learning Strategies of SRL

- Some major categories of learning strategies are: （Weinstein & Mayer, 1983).
  (1) rehearsal strategies such as copying, underlining, or shadowing;
  (2) elaboration strategies such as paraphrasing or summarizing;
  (3) organizational strategies such as outlining or creating a hierarchy;
  (4) comprehension monitoring strategies such as checking for comprehension failures; and
  (5) affective strategies such as being alert and relaxed.

Project Review

Wooden launcher kits



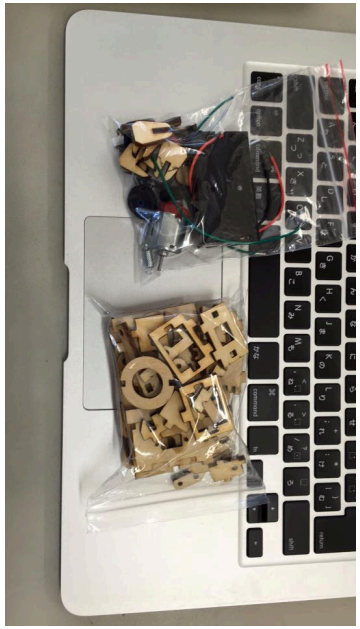
Project Review

Course Design

- Phase 1(2 hours):Teachers guide students to understand the relationship between parts and assembly, so that students can assemble their own without illustration.
- Phase 2(2 hours):The teacher uses the basic circuit diagram to illustrate the relationship between the battery, the switch and the two motor connections and demonstrate the soldering iron soldering, which is then assembled by the student.
- Phase 3(2 hours):After the student is assembled, test and adjust the launcher to launch the wooden bullets and hit the various targets.

Project Review

Course first try



Methodology

Participate

- The school which researcher teaching located at Taitung, Taiwan.
- Members of the informal science classroom included 7-9th grade students who have taken free will to participate.
- 23 students： 7 take type A, 18 take type B.

Methodology

Data collection

- This study is planned to use qualitative research.
- Records of class content and video, student homework and individual interviews and other information.

Methodology

Triangle correction

- Participants are not purposive sampling to increase the sources of validity.
- Integrate different types of courses to increase the validity of method
  validation.
- Courses have professors or other teachers involved in observation and discussion, which can increase the validity of the analyst.

Result

Class

Result

Table 1:Student Characteristics and Performance (5 level)

N	PR	Academic performance	Type	Finish	Phase1	Phase2	Phase3
7	77.9	4.9	A	95.7%	5.0	4.6	4.6
16	3.9	3.9	B	81.3%	4.4	3.7	3.6

Result

Table 2:Organizational strategies performance (5 level)

Learning Strategy	Phase1		Phase2		Phase3	
	H-PR	L-PR	H-PR	L-PR	H-PR	L-PR
Organizational strategy						
Classification	3.92	3.00	3.00	2.09	2.92	2.67
Pre-try	3.75	2.55	3.50	2.27	3.75	3.58
Simulation	**1.5**	**1.55**	2.08	**1.36**	2.75	2.58
seeking learning resources or support	2.75	2.27	2.50	2.09	3.08	3.00

Result

Table 3:Rehearsal strategies performance (5 level)

Learning Strategy	Phase1		Phase2		Phase3	
	H-PR	L-PR	H-PR	L-PR	H-PR	L-PR
Rehearsal strategy						
Make notes	1.67	1.27	1.83	1.36	1.83	1.5
Use notes	1	1	1.50	1.09	1.5	1.33
Update notes	1	1	1.33	1.09	1.33	1.25

Result

Table 4:Elaboration strategies performance (5 level)

Learning Strategy	Phase1		Phase2		Phase3	
	H-PR	L-PR	H-PR	L-PR	H-PR	L-PR
Elaboration strategies						
Self-expectation	3.75	2.91	3.50	2.55	3.75	3.5
Observe others	2.17	3.00	2.92	3.09	1.83	1.83
Learning adjustment	2.08	2.45	2.75	2.00	1.83	1.67
Assist others	2.08	1.82	1.83	1.82	2.08	1.83
Correction capability	2.92	1.73	2.33	1.73	2.92	2.58

Discussion

Positive and Negative strategies

- This study observes that students' PR is related to learning strategies and autonomous learning behavior, but does not represent a positive impact
- Often students need to be guided by how to choose and use the SRL strategy to promote autonomous learning behavior.
- Our students in the learning plan, most rely on intuitive, easy to misjudge the learning curve, resulting in learning disabilities.

Discussion

Positive and Negative strategies

- Our students need the SRL learning strategy, should be learning records (Rehearsal strategy) update and use.
- Students' learning strategies usually operate habitually unless a learner can self-awaken.

Discussion

Hands-on

- In this study, we also found that hands-on courses, easier to cause students to change or to try, use other learning strategies.
- Perhaps students face of new challenges, they will try different ways to learn and solve. This should be the core concept of STEM courses.

Thank you for your attention