

The Development and Application of Evaluating Standards for Creative Problem Solving Items

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I . Introduction

- Scientific Literacy in science education
 - emphasize problem-solving skills in common (Bowen& Roth, 2007; Bybee, 1997; Miller, 1998; Roth & Lee, 2004; Shamos, 1995; Shen, 1975).
- Creative Problem Solving
 - active process of producing new solutions to problems.
 - five components (Kim, 1997)
 - General knowledge
 - Domain-specific knowledge
 - Motivation
 - Divergent thinking
 - Critical thinking

I . Introduction

- purpose
 - developing a evaluating standards for creative problem solving items
 - assessing creative problem solving items on Korea science text books.

II . Research process

Organizing expert panel

Literature survey

Professional review



Selecting category and sub-category

Treffinger(1992)'s CPS model was applied to standards for evaluating



Deciding assessment type

Checklist type



Defining evaluation factor

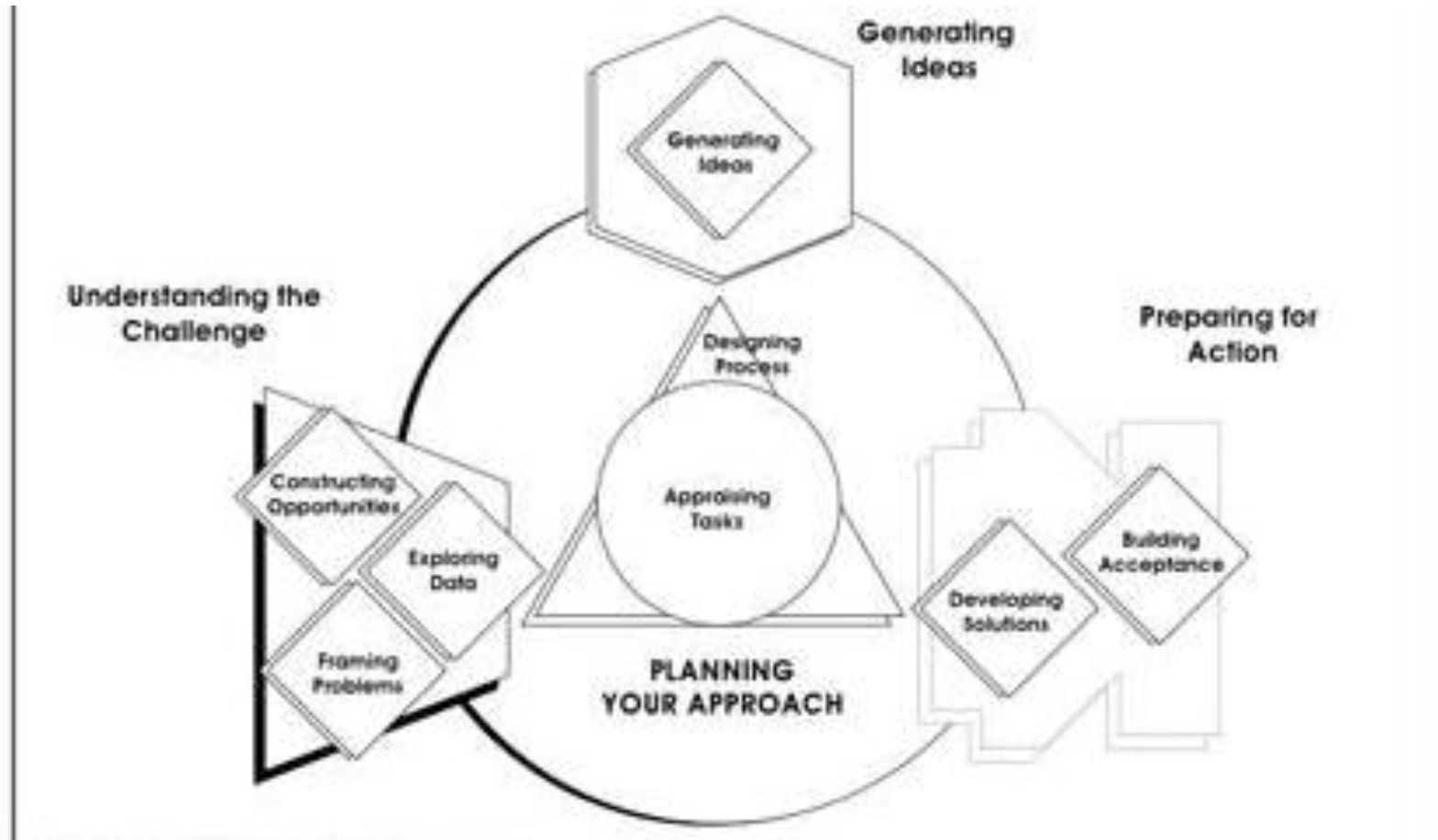
should be reflected the purpose of sub-category in the problems



Applying evaluating standards

to question in science text book.

Treffinger & Isaksen' CPS model (1992)



Treffinger, D. J., Isaksen, S. G., & Dorval, K. B. (2000)

III. Result- evaluating standards (1/4)

Category	Sub-category	Evaluating factor	Definition
Understanding The challenge	Inviting to the problem	Importance of task	Emphasize the importance of the task.
		Presenting situation	Propose a specific situation.
		inducing Challenge	Stimulating challenge to students.
	Exploring data	Presenting scientific material	Present a wide range of intellectual materials.
		Presenting empirical data	Present data that stimulate own experience
		Presenting visual data	Present various visual data
		Presenting emotional data	Present information that stimulates emotional response.
		Presenting controvertible issue	Present information that include controvertible issue
	Raising problem	Type of question	Present statement as a Interrogative sentence
		Checking solver	show who is problem solver
		Stating goal	State goal clearly
Generating idea	Generating Idea	Fluency	Ask fluency of idea
		Originality	Ask originality of idea
		flexibility	Ask flexibility of idea
		Elaboration	Ask elaboration of ideas
Developing solution	Choosing solu tion	Checking availability	Ask to check availability of ideas
		Checking limitation	Ask to check limitation of ideas
		Checking characteristic	Ask to check characteristic of ideas
		setting idea ranking	Ask to set idea ranking
		Choosing idea	Ask to choose best idea
		Reason of choice	Ask reason of their choice
	setting up ac tion plan	Checking necessary condition	Ask to present a necessary condition for solving
		Presenting application	Ask to make use of necessary condition
		Checking obstruction	Ask to check the obstruction
		Presenting way to overcome	Ask to present the way to overcome
		Designing process	Ask to designing the process logically
	Evaluation	setting rubric for solution	Ask to set rubric for solution
		Evaluating solution	Ask to evaluate the effectiveness of solution
		Setting rubric for process	Ask to set rubric for problem-solving process
		Evaluating process	Ask to evaluate the problem-solving process

III. Result- evaluating standards (2/4)

Category	Sub-category	Evaluating factor	Definition
Understanding The challenge	Inviting to the problem	Importance of task	Emphasize the importance of the task.
		Presenting situation	Propose a specific situation.
		inducing Challenge	Stimulating challenge to students.
	Exploring data	Presenting scientific material	Present a wide range of intellectual materials.
		Presenting empirical data	Present data that stimulate own experience
		Presenting visual data	Present various visual data
		Presenting emotional data	Present information that stimulates emotional response.
		Presenting controvertible issue	Present information that include controvertible issue
	Raising problem	Type of question	Present statement as a Interrogative sentence
		Checking solver	show who is problem solver
		Stating goal	State goal clearly

III. Result- evaluating standards (3/4)

Generating idea	Generating Idea	Fluency	Ask fluency of idea
		Originality	Ask originality of idea
		flexibility	Ask flexibility of idea
		Elaboration	Ask elaboration of ideas

III. Result- evaluating standards (4/4)

Developing solution	Choosing Solution	Checking availability	Ask to check availability of ideas
		Checking limitation	Ask to check limitation of ideas
		Checking characteristic	Ask to check characteristic of ideas
		setting idea ranking	Ask to set idea ranking
		Choosing idea	Ask to choose best idea
		Reason of choice	Ask reason of their choice
	setting up action plan	Checking necessary condition	Ask to present a necessary condition for solving
		Presenting application	Ask to make use of necessary condition
		Checking obstruction	Ask to check the obstruction
		Presenting way to overcome	Ask to present the way to overcome
		Designing process	Ask to designing the process logically
	Evaluation	setting rubric for solution	Ask to set rubric for solution
		Evaluating solution	Ask to evaluate the effectiveness of solution
		Setting rubric for process	Ask to set rubric for problem-solving process
		Evaluating process	Ask to evaluate the problem-solving process

III. Result – analyzing question of text book

Category	Sub-category	Rating(%)
Understanding The challenge	Inviting to the problem	23.9
	Exploring data	12.4
	Raising problem	40.2
Generating idea	Generating idea	18.6
Developing solution	Choosing solution	3.8
	setting up action plan	0.4
	Evaluation	0.5
Total.		100

III. Result – analyzing question of text book

Category	Sub-category	Type of text book																
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Understanding The challenge	Inviting to the problem	4	19	17	25	7	2	2	10	3	20	7	9	9	13	10	3	15
	Exploring data	6	11	8	9	1	1	4	4	4	10	5	3	5	3	2	4	11
	Raising problem	12	40	22	26	19	4	7	13	4	29	9	11	38	13	16	8	23
Generating idea	Generating idea	7	18	10	18	5	2	4	7	3	19	8	2	7	3	10	3	10
Developing solution	Choosing solution	0	2	3	12	1	0	0	1	0	0	1	1	0	2	2	1	2
	setting up action plan	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0
	Evaluation	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1

IV. Discussion

- **Educational implications of the developed evaluating standards**

First

- can help to understand of thinking process and ability related with creative problem solving

Second

- teacher can design class for enhancing creative problem solving through understanding of our evaluating standards

Third

- can utilize our standards as a guideline for developing questions.

IV. Discussion

- Suggestion for developing question.

First

- Problem should help students to generate idea and solve a problem by oneself.

Second

- Problem should stimulate student's meta-cognition

Thank you