

A Study of the Influence of RCPS Instructional Design on Students' Scientific Learning Motivation and Scientific Concept Learning.

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Abstract: This research aims at developing revised creative problem solving (RCPS) teaching model, besides we designed the instructions of chemical reaction to promote eight grade students' scientific learning motivation and scientific concept learning. We adopted quasi-experiment study, the experimental group and controlled group all 28 students were chosen, go on the parameter is analyzed together compared with textbook instructions, scale of scientific learning motivation and test of scientific conception learning were used for the two groups in prior test and post test, then we used statistical analysis of covariance (*ANCOVA*) to analyze the differences between the two teaching models. The result of this study finds that RCPS teaching model to be improved student's scientific learning motivation and learning scientific concept were all superior to textbook instructions of controlled group, $p = .001 (< .01)$, and all with high experimental treatment effects ($> .14$). The study also propose that when RCPS teaching model was applied to scientific concept teaching, should be joined the conception introducing stage, and pay attention to students' scientific learning motivation.

Key word: revised creative problem solving, scientific concept learning, scientific learning motivation

INTRODUCTION

Scott, Leritz and Mumford (2004a) pointed out that solve the teaching (creative problem solving, is abbreviated as CPS) through the creative problem with system Training after, except it facilitate professional field the understanding and accumulations of knowledge, can also combine all kinds of relevant fields professional knowledge, and then produced the new idea and solved the unidentified problem complicatedly and defined. Hung(2003) claimed that revised creative problem solving(RCPS), teaching activities of unit of ' aqueous acid soda ' designed, allow experiment research with quasi-experimental design, the result find is it scientific for creativity in pupils fifth grade primary school solve with problem there aren't ability.

RCPS teaching strategy based on the teacher's guide, student produce puzzled and initiate motive, discover the problems, produce idea, seek, answer, comment ancient

bronze mirror result teaching instructions by oneself. This discovers the problems, causes and solves the inherent motive of the mystery in order to explore that contain the principle behind the natural phenomena by oneself with students, it should be able to initiate higher scientific learning motivation than the rule experiment for students to speak to. In addition, a lot of study and point out, the creative problem solves teaching strategy scientific creativity and problem that can promote the pupil solve ability (Scott, et al., 2004a; Treffinger, 2007, 2008; Treffinger, Isaksen, & Stead-Dorval, 2006) .

However, the experiment contents of the textbooks mostly rely mainly on verifying the theory or scientific concept, and design the step of following to be the compassable recipe typed experiment (cooked experiment), the characteristic that textbook experiment instructions is designed is to change a great deal of to control the good one (well controlled) Rule experiment. Aim at offering students to do in fact, get the all the same experimental result finally. So, it aims at proving it is correct whether the scientific concept is that this kind changes one, rule experiment singly, can not offer the chance that students form the scientific topic or discover the problems, student by machinery type, a passive one, whom spontaneity discover the problems make the activity and understand the scientific concept in fact? Can students improve their scientific learning motivation while controlling good experiment from this kind? So, want to promote and implement students' science to explain, communicate, probe into, criticize key ability such as thinking, problem solving, modeling, proving, obviously the watchtower on either side of a palace gate leak to some extent that experiment instructions of the textbook rule is designed.

In sum, no matter the design of CPS or RCPS teaching strategy all aims at stimulating students to use creativity to improve the problem and solve ability, not used to study for originally teaching strategy in scientific teaching or concept, want as the scientific teaching strategy by strategy of CPS or RCPS teaching, involve the department

Research purpose and problem.

According to the research purpose described above, it is this teaching strategy to probe into RCPS teaching strategy and textbook, to the experiment group and after controlling the group to deal with teaching separately, study and reach the competence of showing in two groups of students' scientific learning motivation and scientific concept, and why it will be two teaching main difference of strategies. Enumerate this research problem as follows:

1. What does difference that two groups of student's scientific learning motivation display reach and handle the result showing competence and experiment?
2. Two scientific conception differences displayed to study, student of group, reach, show level and experiment handle what it will be result?
3. Under the teaching strategy of different science, what is the difference which two groups of students learn to display?

Overview of the creative problem solving model

This research is gentle according to the flood in the east Hung (2003) pointed out that the creative problem solving(Treffinger, Isaksen, 1992) should fix for ' creative problem of revision solving teaching strategy ', design the sour soda teaching activity of aqueous solution and stimulate pupil's scientific creativity and promote its ability of

scientific problem to solve, and its result of study finds, the pupil is after the teaching activity of unit of ' aqueous impractical soda ' scientific creativity and problem solve ability and make apparent progress. Instructions that this research further probes into RCPS teaching strategy is designed, learn to have apparent influence about students' scientific learning motivation and scientific concept, further revision in order to accord with stage students' science to study junior middle school strategy this.

About the relevant research of creative problem solving

Treffinger, Isaksen and Stead-Dorval (2006) pointed out that the instructions of creative problem solving all regards dispersing and thinking the starting point that produces a lot of different ideas as, regard disappearing and pondering over and choosing a most possible idea as the destination, among them disperse the instructions that thinks and create the behavior that thinks promptly, by producing the diversification and unique idea; Disappear instructions that think for criticize behavior that think, through screen and choose original idea, regard action orientation as the inference, deduce, compare and contrast each idea, compare and assess all possible choices again, the most effective with the most appropriate judgment and determining by making. Treffinger(2007, 2008) Advocate, should offer the chance of the tool of instructions or activity of applying to particular domain, any tool produced and focused on the idea can be used for assisting student's standards of different particular intension of the grasp in a lot of fields.

Hung (2003) revise creative problem solving from Treffinger and Isaksen(1992), and propose RCPS teaching strategy, design the teaching activity of the unit of ' aqueous acid soda ', allow the result of experiment research to find, the fifth grade primary school pupil's scientific creativity and problem solve ability and all make apparent progress, and it sets up RCPS teaching tactics instructions and is designed and divided into five following teaching stages, say separately

Research approach

This research, according to allowing the experiment to study the law in order to compare two kinds of teaching tactics, whether reach the level of showing as to the difference between student's scientific learning motivation and scientific concept study, divide and design designing with research sample, research tool, RCPS teaching instructions in order to study now, prove as follows.

Research Design

This research aims at probing into and setting up the concept the creative problem based on teaching solve the strategy, take some edition textbook chemical reaction unit as the core and design teaching instructions, adopt and allow the experiment to study the law (quasi-experiment study) ,The junior middle school when choose dividing with a Kaohsiung normality into several classes, two classes of grade eight teaching with a physical and chemical department's teacher, among them class one is based on RCPS teaching and regarded as the experiment group (28 people altogether, 16 boys and 12 girls) Regarded as and controlled the group with the teaching based on textbook (28 people including 18 boys and 10 girls) ,And two class control, in 8 lesson, take chemical reaction teaching of Entrance last two weeks all. Before teaching, carried on the examining ago of two groups of scientific learning motivation scales first, collected the

total achievement of last term as changing one altogether; Behind the teaching, carry on scientific learning motivation examine with the scientific concept learning to test behind scale to two class and then.

Moreover, in examining the score and total score of last term ago in scientific learning motivation scale of class two, if accord with the group and return to coefficient at the time of a homogeneity test, the parameter analysis altogether, compare two groups of students and study the difference displayed and reach the competence of showing in scientific learning motivation and scientific concept, win amount of result handled of teaching, handle the level situation of the result in order to understand RCPS and teaching based on textbook under two kinds of instructions; If does not accord with and return to coefficient at the time of a homogeneity test, show examining the achievement ago of two groups (change one altogether) As to and then examine the achievement (in accordance with changing one) Influence degree, it will influence by group but the different to some extent, it change by full of trees - law (Johnson-Newman method) graceful inside Zhan Analyze two kinds of teaching strategies to the applicable scope of different groups. The explanation designed in this research is gathered together whole as follows:

1. Change one by oneself: Based on RCPS and textbook two kinds of teaching strategies and carry on instructions to design and deal with as the experiment, prove as follows:
 - (1)Instructions of RCPS teaching strategy is designed: Revise RCPS teaching strategy and set up RCPS teaching strategy, and design concrete and feasible teaching instructions according to this strategy.
 - (2)Instructions of the standard teaching strategy of the textbook is designed: Case Mr. with according to experimental activity textbook design as the main teaching strategy according to teach department until teachers' manual carry on teaching, by tell law with book.
2. In accordance with changing one: Experiment group and controlling the behavior in scientific learning motivation and scientific concept study separately of group.
3. Control and change one: Until two class that teach their study achievement close eight grade class, same textbook edition scientifically with one case Mr. ' Chapter one Chemical reaction ' the unit is dealt with controlling the teaching of the group from starting a new term before examination to the first time section as the main content of instructions, experiment group, all last two weeks.

Because this research aims at probing into the experiment group with controlling the group separately after different experiments are dealt with, whether two groups of student's behavior in scientific learning motivation reach the level of showing. So, this scale accords with the purpose of this research, so adopt this one to measuring junior middle school students' motive scale designed in study scientifically, make use of it by strategy of understanding different teaching, experiment group and controlling the students of group to display the difference on to reach the competence of showing in scientific learning motivation.

The test of scientific concept learning

The test of scientific concept learning is to make a comparison between the experimental group and the control group after the first unit "chemical reaction".

I use the first exam results in the first semester as the covariance. After academic adjustment, I proceed to use the exam results of the control group and the experiment from the first exam this semester as post-test results.

In the exam, the questions are mainly from the first unit "chemical reactions", which includes 30 multiple choice questions and 20 group questions. The research exploits sample to randomly choose two 8th grade classes with almost the same academic achievements with 37 students in each class: one as the experiment group and the other as the control group.

Study the daily record

The reason why the research chose "study the daily record" is when the experiment group outperforms the control group on science learning motivation test and scientific concept learning test and reached salient standards, we proceed to discuss the varieties of performances in the classrooms of the experiment group with RCPS and the control group based on textbooks under two different teaching strategies.

The teaching design of RCPS

The teaching design of this research is based on "neutralization and oxidation-reduction reaction" teaching strategy, divided into the preparation of RCPS teaching and teaching procedures and is stated as follows:

1. Prepare the instructions in RCPS teaching

(1) Prepare and make: auto-balloon ' apparatus, as shown in Fig. 2:

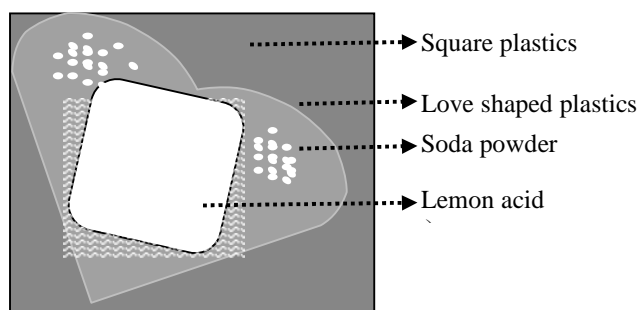


fig2: Auto-balloon structure

(2) Content and principle of the auto-balloon

The contents and principles of auto-balloon:

The most outward layer is easily busted out of the internal pressure.

The second layer heart-shaped plastic membrane contains soda powder.

The third layer which is embedded in the second layer plastic membrane contains small packages of liquid of lemon acid. When the small packages of plastic membrane is busted by force, the combination of lemon acid and soda powder creates neutralization and produce a great amount of CO₂.

If there is enough amount of CO₂ to cause the second layer plastic membrane to swell out of pressure and if the second layer creates enough pressure to bust the first layer, then the heart-shaped plastic membrane will leap out from it.

2. Teaching procedure

(1) Produce puzzled stage

This teaching aims at causing students' curiosity and causing scientific learning motivation at stage. Behind automatic balloon balance serious, one that is inside sour to make sour liquid and little soda ash react and swell while being broken while being hydraulic, until burst outer plastic membrane fry, happen love model balloon, model balloon together with first floor of plastic membrane balance in weight love this.

(2) Stage of discovering the problems

Put forward issue in order to lead them think and go on, explain by student, offer student put forward, produce preliminary idea and form the scientific question for described above phenomenon.

(3) Produce idea stage

This teaching offers student mental work to agitate and form the scientific question gradually at stage. For example, ' and then, observe what phenomena it is before the automatic balloon swells? Does quality or volume change? ', ' why will outer plastic membrane be exploded and started? What may be produced to change? Please guess automatic balloon what materials does it might contain? ' with ' how it examine theses in which you guess material or result? ', etc..

(4) Seek to answer stage

This stage lies in exploring the possible cause in the experiment. Several ' automatic balloon 's of student of our every group, examine its quality M1, write down the material that may contain. Make students impractical and hydraulic and broken, find the total volume after reacting becomes large, the total quality M2 after and then letting student's measurement react, then cut off the love model balloon, and then the balance has quality M3, acts as students find $M1 = M2 > M3$, After M3, the teacher can question: ' material on how examine these response front and back? ', it is ' automatic for balloon ' last content the things take out (including soda ash and citric acids light) ,Prepare cup of three transparent PE, divided into steps such as a, b, c and d, etc. and examined, as extending with further offering students to deduce.

(5) The concept guides and lies between stage

Aim at teacher prove chemical reaction accord with ' quality law of conservation ' and introduce chemical reaction this stages ' sour, such scientific concepts as the properties of the soda and salt ', ' sour soda are neutralized '.

(6) Comment the result stage of the ancient bronze mirror

If students can say ' gas ease has appeared but has lightened ', the students with better possible intensity have already known this gas is CO₂, the teacher can all carry on the following experiment steps and lie between ' the law of conservation of quality ' in order to guide, wrap up and take out small soda ash and citric acid in the automatic balloon, it is heavy to pack into and seal bag and

balance transparently together, press the broken citric acid bag, observed the small soda ash and citric acid response and produced a large amount of gas and water, seal bag swell too, give balance to be serious, can look over, react front and back weight change when its response finishes, seal bag turn on, make gas ease produce, but total quality lighten, can offer student look over actual response situation of automatic balloon again and then, explain the ' chemical reaction ' and ' the law of conservation of quality ' by this.

It is described above to synthesize, design according to chemical reaction unit instructions of this research, and the literature probes into RCPS scientific teaching strategy set up (as shown in Fig.1). This research develops every teaching stage that RCPS chemical reaction instructions designs.

The materials are dealt with and analyzed

This research adopts quantization to study treatment and analysis that the strategy carries on the materials, the materials are collected, dealt with and analyzed at the same time to combine the quality materials and quantization tool. Except answer item by item according to the problem of studying, in order to count and test and reach the experiment which shows competence and handle result η^2 (partial eta squared) Annotate the experiment

Result and discussing

The result of this research is divided into the difference that two groups of students learn to display in scientific learning motivation and scientific concept according to waiting to answer the problem, whether reach the competence of showing and discuss one by one.

Difference which the students of one or two groups display in scientific learning motivation

The scientific learning motivation before and after this research deals with the experiment according to two groups of students scores, after the homogeneity test of coefficient of coming back in the group of Israel, $F = .88, p = .35$, greater than .05 Have not reached the level of showing, so accord with the group and return to homogeneity examination of coefficient. Two groups in scientific learning motivation scale average and standard deviation on must adjust, such as the form 5 shows:

The front and back average of adjustment of the scientific learning motivation of Table 5 and standard deviation

Table 5

Group	Number of students	Average before adjusting	Standard deviation before adjusting	Average after adjusting	Standard deviation after adjusting
Experiment	28	127.14	12.56	127.20	1.95
Control	28	117.14	14.83	117.12	1.95

According to the show of Table 5, the average 127.2 after group adjusts the experiment, is superior to controlling group 117.1; The analysis result of the parameter

altogether, as shown in Table 6:

Table 6 Parameter analysis abstract altogether of the scientific learning motivation

Variation source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	<i>Partial Eta Squared</i>
Covariance	4569.12	1	4569.12			
Among the groups (teaching strategy)	1405.88	1	1405.88	13.25	.001	.20
Deviation	5625.74	53	106.15			

** $p < .01$

As shown by Table 6, $F = 13.25$, $p = .001$, is smaller than .01, reach and show the level, the amount of result handled of the experiment .20, greater than .138. After showing teaching and dealing with, the experiment group is superior to controlling the group on the behavior of scientific learning motivation, have 'high-level result amount'.

Research this materials find student, group of experiment, control group student explore the question that they find and get out of by oneself actively relatively by classroom daily record quality that collect, feel uncertain and curious in the salty sense after teacher's demonstration experiment to especially test the students of group, will explore, carry on the experiment, seek to explain and comment the result of the experiment of the ancient bronze mirror voluntarily. If pick and record showing from the research daily record of the experiment group.

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