

Utilize Theory of MST in technology teaching activities by The Primary School children – “A Pinwheel Toy” Unit Teaching

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ABSTRACT: The main purport of this study is to explore that utilizing theory of MST implements the technology education curriculum in the primary school – the enforcement course of “A Pinwheel Toy”. Using mathematics, science and technology integrated curriculum to carry on teaching researches, designing “A Pinwheel Toy” unit teaching activities for the Primary School of 5th grade class students, make students learn math and science happily and then enhance the opportunity to link theory with reality.

The objects of this study are 5th grade class students. The teaching of the technology education curriculum proceeds three months, which includes 13 sections. In this study of the teaching activities, the research worker carried out teaching, interviews and observation to collect the related data by recording. The findings of the study are summarized as follows:

The students showed positive learning attitude toward the teaching curriculum of " A Pinwheel Toy ". Students can make " A Pinwheel Toy " successfully by the way of cooperation. “A Pinwheel Toy” teaching activity courses are more suitable for high-grade students. The students can discover the way to solve questions by themselves, and also consult teachers on the initiative.

Finally based on the findings and students’ feedback, summarize many suggestions for further studies on the subjects, preparation for an experimental manipulation, teaching methods, student grouping, demonstration of learning outcomes, notes in experimental manipulation, and teaching process on record for reference.

Keywords: Theory of MST, technology education, technology teaching activities, " A Pinwheel Toy "

1.Introduction

The technology in the world has been changing with each passing day. The advance in technology causes many influences. Technological progress and innovation has become a driving force for national progress and development. To cope with rapidly changing technology, the development of technology has changed the direction of teaching and learning. Science and technology education in primary schools can use lively forms of teaching

modules in teaching to improve learning and guide the students to "play in Learning, do in Learning, use in Learning". Modern science and technology teaching must be closely linked to practical life.

Hanlin junior version of the next two areas of life in the fifth unit "Be a friend with wind " activities three " the wind game", by the actual production of windmills, understanding the wind allows an object fluttering or rotation. Four on the field of mathematics Nanyi Ban third unit "point of view,"

teaching objective is to understand the structure of Gauge protractor, angle in order to enroll in the size of the protractor, using a protractor to draw the corner of the specified angle and cultivate a sense of perspective of the amount. 5 on the field of mathematics Nanyi Ban third unit "polygon," teaching objective is that through specific operations, understanding the various angles inside the polygon and calculate the various angles and polygons and then calculate the angles of each polygon point of view and resolve situations related issues. Based on the old learning experience, if the unit of teaching - "A Pinwheel Toy" to mathematics, science and technology (Mathematics, Science and Technology, MST) integration of the three interdisciplinary integrated curriculum teaching strategies, into the current fifth grade arts and humanities, teaching activities, the researchers hope Nengji's study can implement this science and technology education programs, and students are expected to learn through the process of science and technology to construct their own knowledge to develop active exploration and research, problem-solving ability to reach a science and technology education. For students with a scientific and technological literacy of the modern national goals.

2 Literature Review

2.1 MST interdisciplinary integrated curriculum

With the vigorous development of scientific and technological knowledge, we have owned in real life, not a single one-sided knowledge, but pluralistic, diverse, complex and interrelated everything, everywhere with the knowledge of each other. Therefore, through the integration of technology courses, the whole inter-related courses in different fields can make a horizontal integration, so that students' learning is no longer a fragment of knowledge, but is closely related with the life knowledge and life experience.

2.1.1 MST-based integrated curriculum of interdisciplinary

To make Interdisciplinary curriculum accord with the varied and complex real life, some experts in the United States have made use of science and technology education as the main body to integrate concepts of math and science, and then to enable students to learn whole concept of science, mathematics and technology.

New York State MSTe proposed three kinds of implementation of the MST frameworks for

curriculum design, teaching model, as shown in Figure 1:

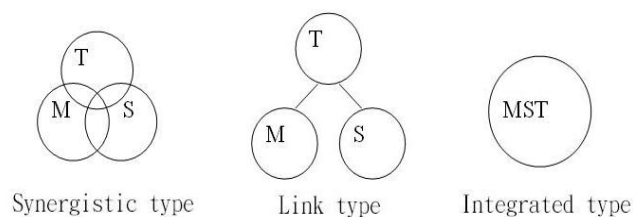


Figure 1 MST three kinds of integration models
Data Source : NYSSI, 1997 [1]

Show from Figure 1, MST can be broadly divided into three kinds of integration models:

- (1) Synergistic type: through mathematics, science and technology teachers in three co-curriculum design and coordination and implementation of teaching, respectively.
- (2) Link type: technology teachers design activities and integrate mathematics, science and other disciplines to the same level.
- (3) Integrated type: Integrate the concepts of mathematics, science and technology activities into the curriculum. In teaching activity implementation, integrate and learn three kinds of concepts.

In a variety of integrated models, synergistic type and integrated type attach greater importance of communication between subject teachers, and their disciplinary boundaries are more blurred.

2.2.2 MST implementation of integrated curriculum

Lomask[2] propose how to design a good MTS students must apply to the scientific, mathematical and technological knowledge, students will have to according to the needs of the activities through the records, observation, measurement or calculation of and so on, to produce the final product, which can be refined assessment.

MST integrated curriculum emphasizes the horizontal and vertical integration of the coherent unit of independent and student self-learning (Independent study) of the teaching strategies, through thematic, title, style and a way to organize project-formed, and an activity Element in Mathematics analysis, science Exploration and Technology application and problem-solving down the completion of the design and use of Instructional System Design (ISD-instructional system design) as shown in Figure 2, five the basic flow: analysis, design, development, implementation and evaluation, and constantly revised delivery feedback,

finally reached the basic spirit of the MST and curriculum objectives.

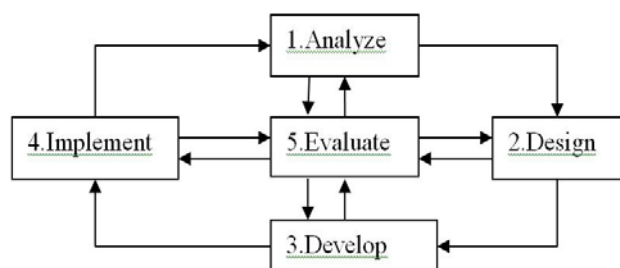


Figure 2 ISD MODEL Data Source : Clark,1995[3]

2.1.3MST Technology Integration Course Assessment

MST integrated curriculum assessment, which is based on the teaching objectives and application of scientific methods of learning outcomes for students engaged in research and analysis of a series of activities. Teachers to student-centered, teachers, supplemented by the idea, grasp the three key as the basis for assessment, a variety of evaluation methods for assessment, to understand the students for the knowledge, skills and affective response and effectiveness.

2.2 Second, teaching related theory of A Pinwheel Toy

" A Pinwheel Toy " as the paper of a windmill, English paper called pinwheel or windmill called pinwheel toy, which refers to the large windmill windmill windmill or toys, in English there is no Rosa xanthina flap windmill windmill or complex of points, so "A Pinwheel Toy," the English name is also a pinwheel. It is more than one regular polygon made of paper, in order to distinguish, and other paper Windmill by a single paper or a single leaf of paper produced by Windmill different, calling them "A Pinwheel Toy." In this study, the general shape of the windmill as the basic framework, introduce the scientific principles of windmills to meet the fifth-grade mathematics, and use readily available of the recycling materials, hand-made by students (DIY, Do It Yourself), in order to inspire students to experience side of things and scientific applications of the contact. Students through hands-on production and observation of the process, to understand the A Pinwheel Toy windmill production and improve the method of re-valve, triggering the interest of students of science and promote scientific and technological literacy of students.

2.2.1 A Pinwheel Toy curriculum ideas

Zhouzhi Xun[4] pointed out that the nine-year curriculum in our country by saying that "curriculum integration" philosophy of education, emphasizing academic knowledge related to integration, focusing on the linkages and integration of curriculum, improving the status of subject teaching.

Kuang-Chao Yu, Kun-yi [5] pointed out that the study through the MST program, which provides students math, science, and technology used in everyday life, and thus to develop their integration capabilities.

Therefore, the A Pinwheel Toy teaching to enable learners to learn and take full advantage of the MST interdisciplinary integration of knowledge, the curriculum followed MST interdisciplinary teaching materials for the content of the preparation of teaching materials to MST through the presentation of the integration of technology to enhance integration capacity of the learners.

2.2.2 The development of the concept of A Pinwheel Toy

The past, the focus of the development of life science and technology teaching materials are placed in junior high phase, in line with the implementation of nine-year curriculum, will need to gradually develop teaching materials for elementary school children, while in primary school textbooks should focus on integrated and interdisciplinary, and combination of life experiences of students[6]. How to make students enjoy learning and have success? Some scholars advocate through "toys" production and the combination of the school curriculum to teach, we can achieve the learning outcome, but in the standard environment, there are quite a number of obstacles and limitations Therefore, when designing teaching materials on the use of integrated math, science and technology (Mathematics, Science, and Technology) of the MST concept to organize materials, choices and life experiences related to the "A Pinwheel Toy" as the teaching content, with "Six Ministry of Education, Science and Education and Learning Network "provides a Web-based learning platform and the" Kaohsiung County, 89 school year, teachers and students of science toys Study Camp Handbook, "designed both to the production of virtual learning and the actual life of teaching materials, allowing elementary school students can either learned related to mathematics, science and technology concepts, but also for their own freedom and creativity to produce unique work, " A Pinwheel Toy "

Domestic scholars and experts in education, through teaching and learning activities are also generally

advocated ways to enhance the technological capability of students, such as the stress design of teaching activities and advocated to train students to think and problem-solving ability to the direction of great importance to explore and experience to do the actual parade courses [7].

2.3 Third, elementary science and technology research and education activities

In the nine-year integrated courses structure, life science and technology education into the school curriculum key learning areas, and therefore the future, all students have access to technology in education, science and technology education is an important breakthrough for many years[8].

2.3.1 Technology and education activities

Science and technology education in our primary schools is referring to the natural areas of life technology, life science and technology courses are courses from the traditional art and craft evolved, its role consists mainly of two aspects: on the one hand to provide students with hands-on learning activities characteristics, in order to further the full integration of all disciplines to promote the learning experience; the other hand, theory and life skills opportunities in the practical experience confirm each other. Lin Yan-lung[9] pointed out that the teaching of science and technology education is to guide students from the hands-on (hands-on) manipulation of the specific things began to turn to the mental Tao chain (minds-on) of the learning process and train them with the design and solve the problem, creativity and critical thinking ability. On the other hand, scientific and technological creativity and emphasis on "concept formation" and "implementation capacity" to develop scientific and technological creativity of the students means that students can use science and technology-related knowledge and skills, and to implement them in order to produce the actual capacity of the finished product [10].

This study of science and technology education activities, based on the theme of A Pinwheel Toy toy, the use of physical demonstration, so that students can learn about the physical process of making scientific principles, and in the process of making science toys to foster problem-solving capability to meet the science and technology education activities, educational goals.

2.3.2 hands-on learning theory

American Philosophical and educator John Dewey promoted from the "learning by doing (Learning by Doing)", opposed to traditional education, classroom

teaching, that "teaching should be student's experience and relevant activities so that students work in the game, the use of children and young people In the off-campus activities on a similar type of activity.[11]. Sivertsen[12] that the hands-on (hands-on) science, is from natural materials and processes, through direct observation and experimentation to learn, all the hands-on activities must be linked to help students make a meaningful structure.

Shyan-Jer Lee[13] to hands-on (DIY) process in primary and secondary interest in cultivating children's creativity in science, personality traits and advocate of science R & D establishments are mostly concentrated in the laboratory, the need for the experience of hands-and courage. Through "learning by doing", in addition to the students motivation to learn can cause other than an active process and can be caused by the scientific interest and access to scientific knowledge and skills. Therefore, how to make a systematic planning of activities, and activities of the cell design and hands-on teaching content of the elements and with each other and thus enhance the overall effectiveness of teaching is also the focus of the research and analysis based.

3 Methodology

3.1 A research topic and the selection of the object

In the development of research topics, that is attempting to mathematics, science, science and technology disciplines be integrated units, to explore the framework of teaching theory in the MST in order to A Pinwheel Toy teaching on elementary school children the impact of science and technology literacy and integration of subjects from the overall style of teaching units in order to learn from experience, as a subsequent teaching various disciplines in science and technology reference.

The study of classes, is intended to teach in schools is currently selected in a fifth-grade class as the main teaching objects. This is to consider children's mathematical skills and information literacy, with high grade (mathematical skills and information literacy higher) of the children as research object, in order to reduce possible resistance and barriers.

Therefore, this study was from the original teaching experience by introducing MST in theory, to explore the A Pinwheel Toy teaching elementary school children the impact of scientific and technological literacy, as a further support the use of technology into teaching and learning in all subjects for reference.

Framework of this study are as follows

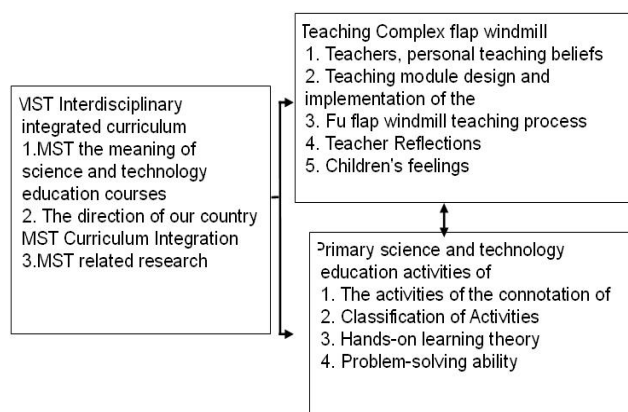


Figure 3、 Research Architecture

3.2 Second, research methods and procedures

This study aims to explore the MST theory, junior high school students A Pinwheel Toy on the feasibility of science and technology teaching and learning activities. Shu-Man Panp[14] pointed out that qualitative research for the beginner, to research issues and research-oriented point of balance between, researchers must management solution that can not be based on personal preferences or options facilitate future research methods, but requires a holistic think about their own style of research questions is What Mody? This study what kind of research method is more suitable?

Qualitative methods, including the collection of three types of information: 1. Depth, open-ended interviews; 2. Direct observation; 3. A written document. Any one of the sources of information were not totally comprehensive as the viewpoint of the program, therefore, through observation, interviews and documentary records will be pooled for a program of the multiple perspectives [15]. Therefore, the researchers conducted for the relevant issues into the teaching, interviews, and collect information relevant documents reach research purposes, so this study, qualitative research methods into future conduct.

In this study, curriculum design and on-site practical teaching, to participate in the observation records, photography, photographs, student work, learning feedback and participation in single-as well as the teachers themselves among the members of awareness and reflection, etc. to collect information in order to facilitate future comparison of , judge, the prosecution nuclear and reflection.

In this study, researchers used the data collection methods are as follows:

(1)Observation

Synergy observed by teachers to assist photography, the process of teaching and learning activities will be filmed as a supplementary explanation to observe, describe purposes, in the review as a reference.

(2) Student Learning Portfolio

Learning portfolio with "A Pinwheel Toy operating homework" (Appendix II), " feedback homework- A Pinwheel Toy Teaching" (Appendix IV), which unit activity in response to the needs of design problems for students to fill out.

(3) Interview

Interview is to collect information on the study of language, so as to study how to learn to understand their world. Before and after teaching activities, teachers and students together for teaching activities, thoughts or suggestions put forward. Contains the outline of the three interviews (Appendix I).

(4)Text analysis method

Recording is a "talking of the notes" can be heard over and over again while the reflection and evaluation have been a record, and that it's organized into transcripts, but help to understand the overall meaning of activity and context.

Teaching journal is an important research data is one of the research process of peer persons [16].

(5) Interpretation Act

Study validity depends largely on the quality of practitioners; and study the reliability and validity is also tied to the experience of the researchers own philosophy, methodological skills and sensitivity [15].

This study was planned after the start, they start to explore the literature associated with the invited experts and scholars benefit advice, and reference to the experience of other teachers, and then assess the scene of teaching and teaching unit design. Everything is ready to be after they started the actual work of teaching, the researchers do first the traditional teaching activities, and then adjust the instructional design. The researchers to collect and record the same time, the students A Pinwheel Toy making the case, the researchers involved in teaching activities throughout the use of video, audio, or record of an interview to collect data. After the data collection to be properly engaged in the collation and analysis of information work, in order to achieve the findings and recommendations to finalize the study report writing.

The researchers of the analysis techniques are as follows:

(1)repeated viewing and reading instruction reflection notes, interview teachers and students, student work and related documents, raw data, with descriptions and notes to reflect, at an appropriate

time for members of the check, to enhance the reliability of data and rigorous degrees.

(2)Data reduction and organization of coding, into meaningful information as the type, in order to verify the information triangulation of validity.

(3)According to the research questions, and gradually formed the opinion that a temporary, subject and type of area.

(4) often associated with coordinated research teachers, professors, experts and scholars to discuss and constantly revised, for the formulation of problems and categories for a qualitative description of analysis and is constantly verified the formation of conclusions.

According to the interpretation of the theme of concepts or categories to analyze the combination of data, and then the rules from the information presented and significance, as the data encoding type, which means finishing in Table 1.

Table1 Data coding explanation sheet

Encoding Type	Mode description	Notes
Teaching journal	Education 981,123 indicates that the information was 98 November 23 for instruction, the log income	
Job One	Operating 02s1 indicated that teaching and learning activities of students after two operations on the 1st single	In this study a total of three copies of a single operation
Learning Logs	Log 3s03 said that teaching and learning activities in large units, after three students feedback on the 3rd Single	A total of two applications with the module on the activities of a single study and feedback
Video	981,206 were recorded for 98 years, said the information was recorded December 6 derived from	
Observation Record	View of 981.13 thousand said the information was 98 November 30 observations	
Record of an interview	Visit 990104s12 seat No. 12 said that students in 99 years, January 4 interview data	

4. Data Analysis

After teaching activities by the students in accordance with the feedback asked Norimaki, the results of analysis of the following table 4:

Table 4, teaching activities asked Norimaki feedback analysis table

Clear from the foregoing, the students studying this module, there are 81.2% agree that the implementation of A Pinwheel Toy teaching activities, learn a lot of knowledge. 75% agree that there can help me to better understand math, science and technology knowledge. 75% agree that there can boost my math, science and technology interest. 62.5% agree that they will automatically learn math, science and technology knowledge. 75% agree that math, science and technology capacity is very important. 71.8% feel that the arts and humanities class is a happy thing. 65.6% feel that their problem-solving skills improve. 68.7% prefer the arts and humanities lesson. 62.5% want to sixth-grade classes in the arts and humanities-related educational activities continue to join. 68.7% agree that in the A Pinwheel Toy in teaching and learning activities can have a good performance.

5. Results and Discussion

From the teaching activities, teacher observations and student and performance problems, suggestions and ideas put forward proposals to implement unit teaching activities are as follows:

- (1) The timing of the implementation of object: The object of the proposed activities to implement at least a high-grade, suitable for use in the arts and humanities-related courses such as implemented in order to understand the science and technology development and its effect on life.
- (2) Student groups: If the characteristics of their students, they may first ask the class instructor to mention a better level of students to serve as team leader, or designated as head of the cadre, and then by the head of the self-selected team members.
- (3) teaching preparation: teachers should design learning first single, lesson plans and various teaching aids to make teaching more efficient.
- (4) interviews events: This module limited the number of students in an interview, if time permits, each interview outline the implementation process can be interviewed in groups in order to enrich the content of their interviews.
- (5) assessment: It is recommended to adopt multiple assessment, and emphasis on cognitive skills and affective performance in all aspects to observe the students learning process and peer-assessment activities with other students, in addition to the original teach teachers and students, the teacher may be invited to Beban participate.
- (6) results show: You can be an active process in order to take pictures, photographic methods

Variable		
Implementation of reconstruction A Pinwheel Toy in class teaching activities, I think learned a lot of knowledge.	Agree	26 (81.2%)
	No difference	5 (15.6%)
	Don't agree	1 (3.1%)
Implementation of reconstruction A Pinwheel Toy in class teaching and learning activities, you can help me to better understand math, science and technology knowledge.	Agree	24 (75%)
	No difference	7 (21.8%)
	Don't agree	1 (3.1%)
I think that the class implementation of reconstruction A Pinwheel Toy teaching activities can increase my math, science and technology interest.	Agree	24 (75%)
	No difference	6 (18.7%)
	Don't agree	2 (6.2%)
Implementation of reconstruction A Pinwheel Toy in class teaching activities, I will automatically learn math, science and technology knowledge.	Agree	20 (62.5%)
	No difference	7 (21.8%)
	Don't agree	5 (15.6%)
Implementation of reconstruction A Pinwheel Toy in class teaching activities, I feel that math, science and technology capacity is very important.	Agree	24 (75%)
	No difference	6 (18.7%)
	Don't agree	2 (6.2%)
Implementation of reconstruction A Pinwheel Toy in class teaching activities, I feel that the arts and humanities class is a happy thing	Agree	23 (71.8%)
	No difference	8 (25%)
	Don't agree	1 (3.1%)
Implementation of reconstruction A Pinwheel Toy windmill in class teaching activities, I feel the ability to solve problems raised	Agree	21 (65.6%)
	No difference	10 (31.2%)
	Don't agree	1 (3.1%)
Implementation of reconstruction A Pinwheel Toy in class teaching activities, I prefer the Arts and Humanities Division of the	Agree	22 (68.7%)
	No difference	8 (25%)
	Don't agree	2 (6.2%)
I hope that in the sixth grade classes in the arts and humanities-related educational activities continue to join	Agree	20 (62.5%)
	No difference	9 (28.1%)
	Don't agree	3 (9.3%)
A Pinwheel Toy in my teaching activities in the windmill can be a very good performance in	Agree	22 (68.7%)
	No difference	7 (21.8%)
	Don't agree	3 (9.3%)

documented. Can also build into the website displays the results.

(7) Note: remind students to proceed step by step, depending on the teacher's teaching steps, blindly seeking quick big chance of failure.

(8) records of the teaching process: The process of teaching audio and video tapes and photographs, is necessary. Problems they encounter to be recorded, and with other teachers to discuss their coping strategies for the purpose of improving the teaching of teachers into the reference.

Conclusion: The rapid development of technology through the A Pinwheel Toy teaching activities, interviews with the group released to enable students to construct their own knowledge, training and research initiative to explore the ability and problem-solving. Let teachers role from provider of knowledge into the promotion of those who carry out the activities as the main body in order to Saeng-oriented teaching, guide students to take the initiative to discover new knowledge, but also make teaching more lively and rich in content.

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