The Design of a Prototype of Collaborative Learning for Creative Thinking of Junior Programmer

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บทคัดย่อ—บทความวิจัยนี้มีวัตถุประสงค์เพื่อออกแบบต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ วิธีการดำเนินการวิจัยประกอบด้วย 2 ขั้นตอน ขั้นตอนที่ 1 การออกแบบกระบวนการดำเนินการของต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ขั้นตอนที่ 2 การประเมินผลความเหมาะสมของต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ โดยผู้เชี่ยวชาญจำนวน 6 ท่าน เครื่องมือในการวิจัยคือ แบบประเมินความเหมาะสมของต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ ผลการวิจัย ต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ ประกอบด้วย 4 องค์ประกอบคือ 1) ปัจจัยนำเข้า 2) กระบวนการเรียนรู้ 3) การประเมินผล และ 4)ผลป้อนกลับ ผลการประเมินความเหมาะสมของต้นแบบการเรียนรู้แบบร่วมมือเพื่อพัฒนาความคิดสร้างสรรค์สำหรับโปรแกรมเมอร์มือใหม่ ประกอบด้วย 6 ด้าน คือ 1) หลักการและแนวคิด 2) วัตถุประสงค์ 3) ปัจจัยนำเข้า 4) กระบวนการ 5) ผลผลิต และ 6) ผลป้อนกลับ โดยผลการประเมินด้านวัตถุประสงค์มีค่าอยู่ในระดับมาก ($\bar{x}$ = 4.29, S.D. = 0.49)

คำสำคัญ: รูปแบบการเรียนรู้, ความคิดสร้างสรรค์, โปรแกรมเมอร์มือใหม่

Abstract— The purposes of this study was to design of a prototype collaborative learning for creative thinking of junior programmer. The research methodology is divided into 2 phases: Phase 1: the design process. The researcher have design of a prototype collaborative learning for creative thinking of junior programmer. Phase 2: the evaluation process. The evaluation of suitability for a prototype collaborative learning for creative thinking of junior programmer by 6 experts. The research tool is evaluation form of suitability for prototype collaborative learning for creative thinking of junior programmer. The result is a prototype collaborative learning for creative thinking of junior programmer with 4 components as follows: 1) Input 2) Instructional process 3) Evaluate and 4) Feedback. The evaluation of suitability for a prototype collaborative learning for junior programmer creative thinking have 6 aspects include 1)Principles and Concepts, 2)Objectives, 3) Input, 4) Instructional process, 5) Evaluate and 6) Feedback. By Objectives aspect has at high level ($\bar{x}$ = 4.29, S.D. = 0.49).

Keywords- Learning Model, Creative Thinking, Basic Programming

I. INTRODUCTION

At the present time Thailand was facing shortage problem of programmer. The shortage of programmer have include 2 issue: the issues of learner and the issues of organization. The issues of learner such as programming is difficult, learner lack of critical thinking process, learner lack of solution process systematically, learner lack of English language skills, learner lack of communication or conversation skills. The issues of organization such as organization thinking everything of computers is duty of programmer, programmer have duty of problem solve related hardware of computer. Therefore be seen that the graduates in the field of computer or related with thousands. But the graduates have ability to work of programmer fewer. Because of in education focused on

theory and the compensation of programmer Thailand have underpayment when comparison with international. [1][2][3][4]

Therefore, the researcher have objective to the design of a prototype collaborative learning for creative thinking of junior programmer.

II. PURPOSES OF THE STUDY

To the design of a prototype of collaborative learning for creative thinking of junior programmer.
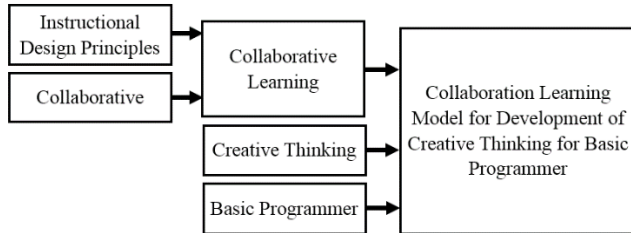
III. CONCEPTUAL FRAMEWORK

Figure 1. Conceptual framework

A. Instructional System Design

Instructional System Design (ISD) is a process for preparing a teaching system that relies on the scientific process which indicates the sequence, procedures, arrangements, activities, and evaluation for the classroom learning experience for learner. Generally, Instructional model developed from research. ISD is the systematic approach to the Analysis, Design, Development, Implementation, and Evaluation of learning materials and activities. ISD includes elements which interrelated for learner have learning objective. Elements of ISD includes learner, instructor, media, and evaluate. Instructional Model is a process of instructional by procedures and methods of theory ISD model for example ADDIE Model, Bloom's Learning Taxonomy, Cathy Moore's Action Mapping, Dick and Carey Model, Gagné's Nine Events of Instruction, Jerrold Kemp Model, Kemp's Instructional Design Model, Kirkpatrick's 4 Levels of Training Evaluation and Merrill's First Principles of Instruction. [5][6][7][8][9]

ADDIE Model is the very core of instructional design and is the basis of ISD by system approach. ADDIE model have 5 step include Analysis, Design, Development, Implementation and Evaluation each step has an outcome into the subsequent step. [10][11][12][13][14]

B. Collaboration Learning

Collaborative Learning is a approaches applied to multiple subjects and multiple levels by instructor create group (3-4 learners per group). The learner in group have be different learning and responsible for work of group together. The learner will be achieved by all member in the group successfully so learner assistance dependency on the assistance of all others. [15][16][17][18][19][20] Essential components for collaboration learning by Johnson and Johnson includes 1) Positive

Interdependence: learner have assistance dependency by activity of instructional, 2) Face-to-Face Promotive Interaction: learner have discussions in the group, 3) Individual Accountability: learner is assigned to work at fully, 4) Interpersonal and Small Group Skills: learner have skill of social and skill of work of group and 5) Group Process: Group have systematic approach performance and achieve to goals. Essential components for collaboration learning by Slavin for example STAD (Student Teams – Achievement Division), TGT (Team-Games Tournament), TAI (Team Assisted Individualization), CIRC (Cooperative Integrated Reading and Composition) and Jigsaw. [19][20][21]

C. Creative Thinking

Creative Thinking is a process of the brain to solve problems or defects. Which action multiple direction and the novelty. Creative Thinking have includes Originality, Flexibility and Fluency by based on the principle of cause and effect to find the answer right. The type of Creative Thinking includes 1) Divergent Thinking, 2) Lateral Thinking, 3) Aesthetic Thinking, 4) Systems Thinking and 5) Inspirational Thinking. [22][23][24][25][26][27]

D. Computer Programmer

Computer programmer is a process instructor for computer to perform solving of human. The solving of computer is a sequence process by computer language for example COBOL, BASIC and C++. Activity of programming such as analysis, development understanding, generating algorithms, verification of requirements of algorithms including their correctness and resources consumption, and implementation. In addition, related tasks include testing, debugging, and maintaining of computer programs[28][29][30].

Basic knowledge required in programming includes 1) Know How to Declare Variables: variable can be any name however the best practice mentioned is that the variables must be related to what the programming and data types like int, double, long, float, short, string, boolean, char etc. 2) Know How to Use Basic Flow of Controls: statement of programming such as If and else statement, while loop, do while loop, for loop and switch statement and 3) Acquaint yourself with Arrays and Function

IV. RESEARCH METHODOLOGY

A. Population and Simple

Group experts is graduated in PhD, with specialize and a minimum of three years in teaching experience, amount 6experts

B. Research Tool

The suitability evaluation of the design of a prototype collaborative learning for creative thinking of junior programmer for 6 expert by 5 level rating scale.

The research is research and development, and have process in research methodology 2 phase.

Phase 1: Analysis and synthesis

- Analysis of the study of problems for teaching and learning
    - Analysis of collaboration learning
    - Analysis of principles design of instructional
    - Analysis of creative thinking
    - Analysis of basic of programmer
    - Analysis of research related
    - Synthesis of create a conceptual framework

Phase 2: Design

- Design of a conceptual framework
- Design of a prototype collaborative learning for creative thinking of junior programmer.
- Suitability evaluate of the design of a prototype collaborative learning for creative thinking of junior programmer by 6 expert.
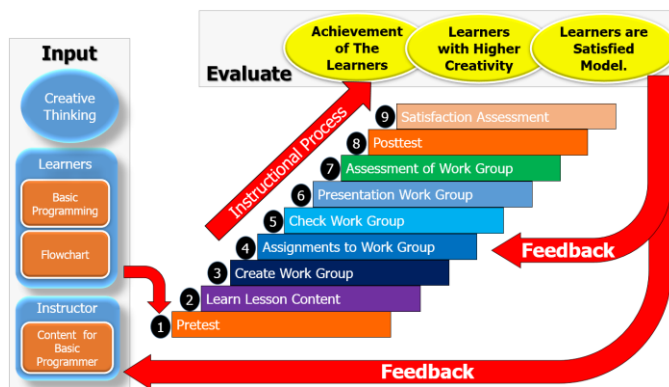
V. RESULT

Figure 2. a prototype collaborative learning for creative thinking of junior programmer

A. *A prototype collaborative learning for creative thinking of junior programmer have with 4 components as follows*

1) Input : The Input of the design of a prototype collaborative learning for creative thinking of junior programmer by 6 expert have 5 components as follows.

a) The learner have knowledge in basic programing: The learner been through study and understood in principles of basic programing.

b) The learner have knowledge in flowchart writing: The learner can be understood and design in algorithm of program, and flowchart writing for other programmer.

c) Instructor: The person execute for control the activity of learning for development creative thinking and collaboration within learning process.

d) Content for basic programmer: The analysis and synthesis content for basic programmer in language of computer programming for example PHP language and Java language.

e) Creative thinking: Theory creative thinking processes of Torrance have 5 step include 1) Fact Finding, 2) Problem Finding, 3) Idea Finding 4) Solution Finding and 5) Acceptance Finding.

2) Instructional process: The Instructional process of the design of a prototype collaborative learning for creative thinking of junior programmer have 9 components as follows.

a) Pretest: The pretest is assessment of creative thinking process for learner before start learning in a prototype collaborative learning for creative thinking of junior programmer.

b) Learn Lesson Content: The learner have learn content of basic programmer in language of computer programming for example PHP language and Java language by content through analyze and synthesize of instructor.

c) Create Work Group: The instructor have execution create group of learners (2 – 3 learners / 1 Group) contains learner clever, learner mid and learner foolish.

d) Assignment to Work Group: The instructor have assignment of development software for user to work group and all module of work group have connects and relationship.

e) Check Work Group: The instructor have check progressive of development software for user of work group. The software have accuracy by analysis and design (System flowchart).

f) Presentation Work Group: The work group have presentation to software by technology and user manual.

g) Assessment Work Group: The instructor have understanding assessment of learner in work group by interview (one to one / one to group).

h) Posttest: The posttest is assessment of creative thinking process for learner after learning in a prototype collaborative learning for creative thinking of junior programmer and compare the results assessment of pretest and posttest.

i) Satisfaction Assessment: The learner have satisfaction assessment of a prototype collaborative learning for creative thinking of junior programmer.

3) Evaluation

a) Achievement of The Learners: The evaluation process by score of pretest compare score of posttest.

b) Learners with Higher Creativity: The evaluation creative thinking process of learner by score for creative thinking of pretest compare score for creative thinking of posttest and the result of observe by instructor.

c) Learners are Satisfied Model: The evaluation result of satisfaction learner by questionnaire of

satisfaction of a prototype collaborative learning for creative thinking of junior programmer.

4) Feedback: The feedback is result of evaluate for return to Improves to input and instructional process.

B. The result of suitability of the a prototype collaborative learning for creative thinking of junior programmer.

TABLE I.   TABLE OF THE RESULT OF SUITABILITY OF A PROTOTYPE COLLABORATIVE LEARNING FOR CREATIVE THINKING OF JUNIOR PROGRAMMER

List of assessment	Assessment		Suitability level
	$\bar{x}$	S.D.	
1.Principles and Concepts	4.33	0.52	high
2.Purposes	4.67	0.52	Very high
3.Input	4.17	0.53	high
4.Instructional Process	4.40	0.49	high
Assessment of Knowledge and creative thinking)Pretest(	4.50	0.55	high
Learn lesson content	4.33	0.52	high
Create work group	4.33	0.52	high
Assignment to work group	4.50	0.55	high
Check work group	4.50	0.55	high
Presentation work group	4.33	0.52	high
Assignment of work group	4.50	0.55	high
Assessment of Knowledge and creative thinking)Posttest(	4.17	0.41	high
Satisfaction assessment	4.40	0.55	high
5.Evaluation	4.17	0.38	high
6.Feedback	4.00	0.00	high
Total	4.29	0.49	high

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