

The Influence of learners' creativity by Gamification Teaching System

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Abstract

This study designs a Gamification of Teaching Assessment System and attempts to find if the system can stimulate learners' creativity. It practices gamification teaching and treats 47 freshmen of university as subjects. By Creativity Assessment Packet, it evaluates the effect on learners' creativity. According to research findings, creative gamification teaching reinforces overall creativity. It significantly influences fluency, flexibility and precision. It means that learners can enhance thinking competence in short time. They have higher precision and develop association by past knowledge and experience in order to provide more diverse solutions.

Key words: creative, creativity gamification teaching system, creativity assessment packet

Introduction

Traditional instructional model gathered up learners in the classrooms and focused on teachers' knowledge instruction in class. After class, by reports and assignments, it enhances learning. Teacher-student interaction in Flipped Classroom enhances learners' learning motivation [1]. Learners preview video before the class and learn on line according to their learning progress. In class, students and teachers discuss with each other and the core spirit is learners' participation, active learning, cooperation & discussion and interaction with teachers. Learners become the active ones and teachers transform from original role to lead the learning to guide and assistant of learning. Yeh [2] constructed one online learning game platform "PaGamO" and learners can occupy the territory by solution games after class to expand the power. Classcraft [3] is a free online educational role-playing game that teachers and students play together in the classroom. It accomplishes the goal of learning in the game. Gamification platform develops thinking method and content from learners' perspective and it can enhance learners' active learning.

Thus, based on traditional instructional model, this study introduces creative gamification teaching and develops one

creativity gamification teaching system. Progress of curriculum becomes flexible and it supports interaction between teachers and students, provides various types of game and records learners' research process. In the content of this curriculum, by making digital game as an example, through gamification teaching, it instructs game making and triggers learners' learning motivation and enthusiasm by their preference for games in order to explore effect on learners' creativity.

Visualization of system can effectively support concept of Gamification to strengthen learners' self-control and recognition [4]. Thus, characteristics of the creativity gamification teaching system are shown below: (1) flexibility: the system complies with different class activities, including instruction, test, reports and evaluations to manage different types of game. (2) interaction: the system can cope with progress and rules of class activities, such as learners' speeches, interaction between teachers and students, etc. (3) gaming: the system can manage figures of learners' Gamification, such as states and skills of characters, experience, game properties obtained, etc. (4) recording: the system can collect data of instructional process in class for the following analysis. Purposes of this study: (1) to develop one creativity gamification teaching system in order to practice concept of gamification teaching. (2) to find if Gamification teaching can influence learners' creativity of game making.

Gamification of Education and Creative Teaching

Currently, Gamification is a new field which develops rapidly. Deterding et al. [5] defined Gamification as using game design elements on "non-game" content. Viau [6] stated that when learners have learning motivation, learning effect can be easily enhanced. Gamification can satisfy the following (1) need of autonomy; (2) demonstration of personal competence by challenge; (3) construction of relationship with others and perceived value in games. These are three main factors to stimulate learning motivation. Instructional Gamification simply applies game elements on education. It is based on games and the content and attribute are remained.

Dicheva et al. [7] realized that practice of research on

education mostly focuses on expansion of current Learning Management System (LMS) or APP of mobile phones. In other words, learners use it in review after class and advanced study and the courses with physical classrooms. However, in classes of physical classroom, it lacks research on Gamification. As to physical classroom, there is Gamification development system, such as Classcraft [3] and ClassRealm [8]. They both are online role-playing games to enhance learners' interest. By the system, it manages classroom rules and learners' learning performance and situation. However, Sant [9] stated that this kind of system only develops games in "classroom" instead of changing "teaching content".

Creative thinking instruction is important teaching method and it can trigger learners' creativity. Creative thinking instruction should be introduced in different subjects and support traditional teaching to create new field in original base [10]. "Creativity teaching" aims to cultivate students' creativity, trigger learners' learning interest and encourage learners to learn to think. Roles of teachers and students become diverse and interesting.

Williams [11] suggested that in instructional situations, cognitive and affective behaviors significantly influence development of creative potential. With the tools to evaluate cognitive and affective behaviors, it will recognize the progress of learners' creativity. Williams proposed scale on potential creativity [12]: Williams' Creativity Assessment Packet (CAP) which includes 12 simple and unfinished pictures. Subjects accomplish the pictures by painting with their intuitive reaction and name the finished pictures. Scoring is classified into fluency, openness, flexibility, originality, precision, and entitling. By these 6 dimensions, it can effectively measure creativity.

Research Method

The purpose of this study is to explore effect of creativity gamification teaching system on creativity. The subjects were freshmen of university who did not have digital game making experience. In the process, creativity gamification teaching was implemented. Finally, they should produce the finished work of digital game. Before and after the experiment, this study conducted the measurement by CAP in order to explore effect of gamification teaching system on creativity.

A. Research Hypotheses

As to effect of creativity gamification teaching on creativity: with learning method of creativity gamification teaching, learners who have never experienced the teaching will receive various stimuluses. It will lead to effect on creativity. Thus, hypotheses are shown below: after creativity gamification teaching,

1. it significantly influences learners' "fluency".
2. it significantly influences learners' "openness".
3. it significantly influences learners' "flexibility".
4. it significantly influences learners' "originality".
5. it significantly influences learners' "precision".
6. it significantly influences learners' "entitling".

B. Design of instructional materials

The objective of this curriculum is to allow beginners to experience game making process by program teaching. The purpose of the course is game making. By Adobe Flash

Professional development environment and ActionScript 3.0 code, subjects produce Flash / AIR games. Regarding the program of games, knowledge instructed is shown as follows:

1. Basic language of program code.
2. Concept and skill of game design.
3. Practice of AIR cross platform development by Android.

Thus, teaching material designed in this study is based on animation and program instruction. It also enhances creativity learning. Teaching content is introduced according to 6 creativity dimensions of CAP. Correlation between content of teaching materials and creativity instruction is shown in TABLE I. TABLE II is content of different courses.

TABLE I
RELATIONSHIP BETWEEN CONTENT OF TEACHING
MATERIALS AND CREATIVITY TEACHING

Content of program teaching	Creativity teaching
Logo animation, frame control and title of game	openness, originality, precision, entitling
Game option button	openness, precision
Character introduction/rule of game	openness
Game construction mechanism	flexibility, originality
Collision and feedback	fluency, flexibility
Control of figure increase and loss and feedback	precision, openness
Multiple game control	fluency, openness, flexibility
Pause and finish	openness
Music of different scenes	precision
Cross platform design	openness, flexibility

TABLE II
TEACHING CONTENT OF DIFFERENT COURSES

Course	Teaching content
The first course	Introduction of course and signing of agreement, Williams' CAP pretest, variable announcement, operator, condition judgment, loop and array
The second course	Function, object orientation, debug, animation and frame control
The third course	Time event, mouse and video control, keyboard and text field control
The fourth course	Sound control and announcement of access
The fifth course	Finish of practice and report, Williams' CAP posttest

C. Analysis of scale

According to pretest and posttest of Williams' Creativity Assessment Packet and experts' evaluation, this study explores learners' change in six dimensions of creativity and effect of creativity gamification teaching.

D. Experimental subjects, practice time and environment

This study conducted creativity teaching in one university of central Taiwan. The subjects were 47 freshmen in Department of Information Management. 51.1% were males and 48.9% were females. They did not have experience of game making. Group division in experiment was according to learners' free will. There were three groups with 4 subjects in each and eight groups with 5 subjects in each, with a total of 11 groups. Random codes were C1-C11. Experiment was practiced in five weeks. One course was implemented every week, including totally 15 hours. Experimental environment

was computer classroom with broadcast system in school.

Analysis and Discussion

A. Expert validity analysis

In order to examine the effect of learners' experience of creativity gamification teaching on creativity, this study invites two experts in related field for the evaluation. Two experts have working years more than 15 years. For the concern of validity consistency of experts' evaluation, this study adopts the analysis by Levene variance homogeneity and one-way ANOVA. It effectively retrieves 47 samples. As to the result, in creativity pretest homogeneity test, Levene statistics is .006, $P = .941 > .05$, in posttest homogeneity test, Levene statistics is .005, $P = .942 > .05$. It means that two experts variance difference is insignificant. It can be regarded as consistency (Table III). As to creativity pretest of One-way ANOVA, $F = .046$, p-value is .831 $> .05$, posttest $F = .029$ and p-value is .864 $> .05$ (TABLE IV). It does not reach significance level. Thus, the scoring is consistent and it shows expert validity.

TABLE III
LEVENE VARIANCE HOMOGENEITY TEST

Creativity	Levene test	Freedom degree of numerator	Freedom degree of denominator	Significance
pretest	.006	1	92	.941
posttest	.005	1	92	.942

TABLE IV
ONE WAY ANOVA

Creativity	Sum of square	Degree of freedom	Average sum of square	F	p-value
Within-group pretest	43.574	1	43.574	.046	.831
Within-group posttest	17.021	1	17.021	.029	.864

B. Pretest and posttest analysis of Williams' Creativity Assessment Packet

According to hypotheses, this study conducts "pair sample T test" on scores of pretest and posttest in order to examine significant difference among the variables. Table V is statistics of groups and Table VI is pair sample T test.

TABLE V
STATISTICS OF PRETEST AND POSTTEST

Group		Number	Average mean	Standard deviation	Standard deviation
Fluency	pretest	47	5.23	.937	.137
	posttest	47	5.83	.481	.070
Openness	pretest	47	13.330	3.1884	.4651
	posttest	47	14.372	2.4814	.3619
Flexibility	pretest	47	4.298	.8576	.1251
	posttest	47	5.298	.6729	.0982
Originality	pretest	47	12.777	3.2867	.4794
	posttest	47	13.117	3.3170	.4838
Precision	pretest	47	4.170	3.2257	.4705
	posttest	47	6.489	3.3984	.4957
Entitling	pretest	47	7.745	2.9003	.4231
	posttest	47	8.128	2.0522	.2993
Total score	pretest	47	118.376	21.5657	3.1458
	posttest	47	129.479	7.5896	1.1065

TABLE VI
PAIR SAMPLE T TEST OF PRETEST AND POSTTEST

Dimensions	Pair variance difference		pair sample T test		
	Average mean	Standard deviation	t value	Degree of freedom	p value
Fluency	-.596	.851	-4.799	46	.000***
Openness	-1.0426	3.8502	-1.856	46	.070
Flexibility	-1.0000	.9325	-7.352	46	.000***
Originality	-.3404	4.4953	-.519	46	.606
Precision	-2.3191	4.3004	-3.697	46	.001**
Entitling	-.3830	3.0076	-.873	46	.387
Total score	-24.3830	33.7246	-4.957	46	.000***

C. Outcome analysis of collaborative learning

In valid questionnaires, 74.5% learners' overall creativity is enhanced. 10 of 11 groups show higher Collaborative Creativity. TABLE VII is growth rate of Top Three groups (C3, C2, & C1) with increased total score of creativity.

TABLE VII
TOP THREE GROUPS WITH GROWTH OF COLLABORATIVE CREATIVITY

Code of group	C3	C2	C1
pretest	122.0	142.1	153.0
Creativity posttest	171.9	186.8	195.3
Growth rate	40.90%	31.46%	27.61%

Conclusion

This study develops a "creativity gamification teaching system" with flexibility, interaction, gamification and recording and introduces it to game program instruction. In order to examine the effect of learners' creativity. There are 47 subjects were reached by the gamification teaching system. Through Williams' Creativity Assessment Packet, it evaluates learners' creativity performance.

According to the result, it shows that overall creativity is reinforced. The learners can enhance thinking competence in short time. Fluency, flexibility and precision are considerably strengthened. They have higher precision and develop association by their past knowledge and experience in order to provide more diverse solutions. By using this system show higher effectiveness on creativity for cooperative learning. This creativity gamification teaching system can effectively enhance learners' interest and motivation, provide multiple solutions and upgrade precision of games.

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