Construction of a Blended TRIZ Creative Learning Platform*

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The purpose of this study is to develop a blended TRIZ (Teoriya Resheniya Izobretatelskikh Zadatch) creative learning system model and framework that can be used to construct a blended TRIZ creative learning internet platform. This study uses literature analysis to summarize and construct the items included in the blended TRIZ creative learning platform and develop an expert questionnaire. The results of the expert questionnaire are analyzed statistically to develop the blended TRIZ creative learning system model. This model includes the system's development objectives, design, and mechanisms; the TRIZ framework; and the platform functions used to construct the blended TRIZ creative learning platform. This platform is then used to improve the quality of creative instruction and cultivate an appreciation for innovation among students, ultimately enhancing their creative abilities.

Keywords: blended learning; TRIZ; creative learning; learning platform

1. Introduction

The developments in internet technology have caused instructional strategies and tools to change rapidly. As a result, the application of blended learning in education has received increased attention from scholars. Blended learning not only combines online and traditional face-to-face learning but also transcends the limitations of time and space. Blended learning combines the advantages of internet learning with traditional face-to-face interaction and cooperative learning [1]. The application and development of blended learning in the domain of engineering education is quite feasible and deserves further exploration.

According to the 2010–2011 Global Competitiveness Report, released by the World Economic Forum (WEF), Taiwan's competitiveness ranking advanced to thirteenth in the world in 2010 [2]. Taiwan's rise in the rankings was largely due to the WEF's belief that the nation's economic development had evolved into an innovation-oriented system. As a result, Taiwan received high ratings on the indicators related to innovation. Thus, knowledge management and product innovation educa-

tion at university level are clearly significant issues. If creative thinking instructions are applied to the engineering education system in Taiwan, the country will benefit from the advancement of engineering knowledge, the development of technology, and the improvement and innovation of products. For this reason, instructional strategies, processes, and accomplishments deserve in-depth exploration and research.

This study uses the blended learning method in the TRIZ (Teoriya Resheniya Izobretatelskikh Zadatch) model to design the education system, as this model is effective at using information technology to enhance the effects of creative learning. This study has two purposes:

(1) To develop a model and a framework for the blended TRIZ creative learning system.
(2) To construct an internet platform for the blended TRIZ creative learning system.

2. Literature review

The purpose of this study is to develop a blended TRIZ creative learning system model and framework that can be used to construct a blended TRIZ creative learning internet platform. Thus, the litera-

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ture related to blended learning, creativity and creativity teaching, TRIZ, and learning has been reviewed and summarized.

2.1 The content of blended learning

Blended learning refers to the blending of more than two kinds of learning methods or media tools. Osguthorpe and Graham argue that teachers who construct a blended learning environment have six achievable objectives: 1) educational richness, 2) knowledge that can be saved and retrieved, 3) social interactivity, 4) personal agency, 5) saved costs, and 6) ease of modification [3]. According to Mortera-Gutierrez, in a blended learning context, the combination of traditional instruction methods and information technology creates infinite educational possibilities. Teachers can utilize these possibilities to reflect the richness of education [4]. Table 1 shows the definitions of the blended learning examined in this study:

The goals of teaching and learning can be achieved by integrating various teaching methods and media with both internet learning and face-to-face teaching. This strategy enables teachers to create the best learning environments and tools to respond to student's individual differences. Through combining these materials and methods, learners are better able to effectively learn online and face-to-face and to conduct autonomous learning. Learners can engage in efficient online learning, face-to-face learning, and active learning via diversified teaching technologies and relevant teaching strategies. Moreover, the construction of a blended learning model requires components such as learners, teachers, learning contents, and teaching resources to be taken into account, as shown in Table 2.

2.2 Creativity and the content of the creative instruction

Guilford claims that creativity is a characteristic of divergent thinking [13]. Yeh argues that 'creativity refers to the process experienced by the individual in a specific area through which it produces an appropriate, original, and valuable product.' This creative process involves the integration and effective application of cognition, emotions, and capabilities. Creative expression is the result of an individual's knowledge, experience, intentions (e.g., attitudes, inclinations, and motivations), techniques, or strategies within the environment [14]. Cultivating innovation, therefore, helps enhance a student's creativity. Teachers who use novel, original, or inventive instructional methods are practicing creative instruction. The current study compiles several objectives in creative instructional design, as shown in Table 3.

2.3 TRIZ (Theory of Inventive Problem Solving)

The TRIZ was created by the Russian inventor Genrich Altshuller in the 1940s. TRIZ is an abbreviation of the Russian term 'Teoriya Resheniya Izobretatelskikh Zadatch.' In English, the term is translated as 'Theory of Inventive Problem Solving.' After Altshuller analyzed over 400 000 patents, he summarized the common attributes, repetitions, and innovative and inventive thought logic of patent inventions to form the theoretical basis for the TRIZ [15]. Traditional engineering methods use compromise to resolve contradictions within products. In the TRIZ, however, such a compromise is not conducive to innovation. According to the TRIZ, inventions represent new thought directions that seek to overcome such contradictions and cause the parameters that produced the contradiction to develop correctly. The current study borrows from the TRIZ and develops an instructional method that uses diverse creative instruction to elicit active learning, motivation, and interest from students. In Fig. 1, the TRIZ integrates the steps needed to resolve creative problems into the operational procedures of the creative learning platform. By following these steps, teachers can improve their creative instruction strategies to

Table 1. Compilation chart of the content of blended learning

Researcher	Definitions
Singh & Reed (2001)	Blended learning can be observed as a type of learning plan in which the learning takes place based on learning objectives, effects, and the originally selected optimal transmission models [5].
Valiathan (2002)	Blended learning activities include traditional face-to-face classroom instruction, online digital learning, and self-learning [6].
Procter (2003)	Blended learning can effectively integrate different transmission models, instructional models, and learning methods [7].
Osguthorpe & Graham (2003)	Blended learning combines face-to-face instruction with remote instructional transmission systems to seek the optimal results and the best combinational balance for the two systems [3].
Finn & Bucceri (2004)	Blended learning can effectively integrate different learning techniques, technologies, and transmission models to conform to specific communication, knowledge sharing, and information needs [8].
Oliver & Trigwell (2005)	Blended learning integrates traditional and internet-based instruction. It integrates the media and internet-learning tools. It also integrates instructional methods and instructional technology [9].

Table 2. Compilation of the considered items used to plan the blended learning model

| Author	Consideration items	Sub-items
Bersin (2004) [10]	Learners	• The capabilities possessed and expected to be possessed by the target person • The amount of time that can be devoted by the target person • The motivation that can be devoted by the target person
	Time	• The time needed to plan development • The time of implementation • The time needed for completion
	Scope	• The scope of target persons (learners) • The need for frequent updates in the know-how required by learners
	Application	• Do the learners need to be evaluated? • Does there need to be certification? • Is it necessary to track the tasks completed by learners? • Is it necessary to test the impact of incomplete learning?
	Content	• Are there experts who work with the development of content? • What is the usable longevity of the content?
	Resources	• Budget • Experts • Content developers
Brennan (2004) [11]	Conditions in education training	• Urgency of training • Requirements of training effects
	Resources that can be used in development	• Expert resources • Budget arrangement conditions
	Analysis of target persons	• The possibilities and convenience for learners who use actual training areas • The background characteristics of learners • The information literacy of learners • The learners' possession of related hardware equipment • The learning motivation factors for learners
	Characteristics of learned content	• The value of the developed learned content for the organization • The knowledge forms involved with the learned content
Epic Group plc (2003) [12]	Learning output	• What are the output types of learning?
	Learners	• The number of learners • The geographic and location distribution of learners • The time and schedules of learners • The factors motivating learners • The analytical capabilities of learners
	Resources	• Human resources that can be provided by the organization • Various basic infrastructure that can be provided by the organization • Technical resources that can be provided by the organization • Budget resources that can be provided by the organization
	Learned content	• The extent to which the learned content has to be maintained on a regular basis
	Budget size	• What is the budget that can be used to satisfy the maximum learning needs? • What is the budget required for future updates and maintenance?
	Extent of benefits	• The extent to which the learned content helps the organization achieve its short-term or long-term objectives • Support for learners in learning • The support received from the management
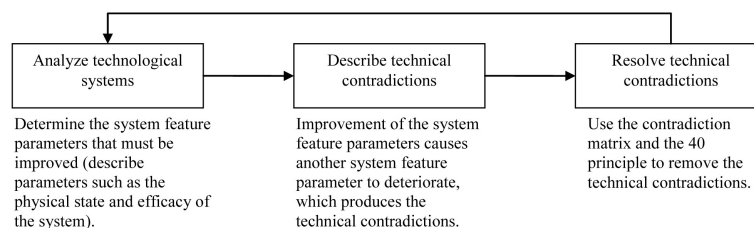
Fig. 1. Three steps to resolving creative problems.

inspire creativity and enhance problem-solving abilities among their students.

2.4 Functions of the blended creative learning platform

Designing and planning a good online design course and learning environment requires the considera-tion of items such as design education, instructional theory and methodology, and the development of information technology [16]. This study uses a basic theoretical design combined with a blended creative learning process to construct the blended creative learning platform. Students who learn under this platform can devote themselves to a meaningful

Table 3

| Objectives in creative instructional design	Item
1. Create a lively and open instructional context	• Cultivate a motivation for creativity • Cultivate creative personality traits • Develop capabilities in creative thinking • Cultivate a classroom atmosphere and environment conducive to creative behaviors
2. Administer creative and diverse instructional evaluation	• Assist students in conducting holistic evaluations of problems • Creatively use existing knowledge • Encourage the direction of multiple solutions • Provide suitable problems for thought
3. Skillfully use instructional methods in conjunction with creative thinking	• Cope with individual differences • Skillfully use instructional media and creative instruction design • Encourage bidirectional interaction between teachers and students • Encourage students to develop sensitivity toward the problem • Inspire students' mental flexibility
4. Adjust the authoritative role of instructors	• Abandon the authoritative role of instructors and instead encourage the students with an accommodating attitude • Respect any childish or even ridiculous questions from students • Appreciate student expression and praise student opinions • Avoid giving positive value judgments for student actions • When criticizing student opinions, explain the reasons for doing so
5. Encourage students to freely carry out presentations and operations	• Emphasize the subjectivity of learners and give them a chance to experiment freely • Give students more opportunities to engage in free experimentation and creativity • Instead of emphasizing the memorization of knowledge, focus on knowledge application • Give students a chance to come into contact with nature and society • Emphasize novel, flexible, and high-efficacy learning strategies and methods • Provide learning motivations for creative activities and pursue creative learning objectives
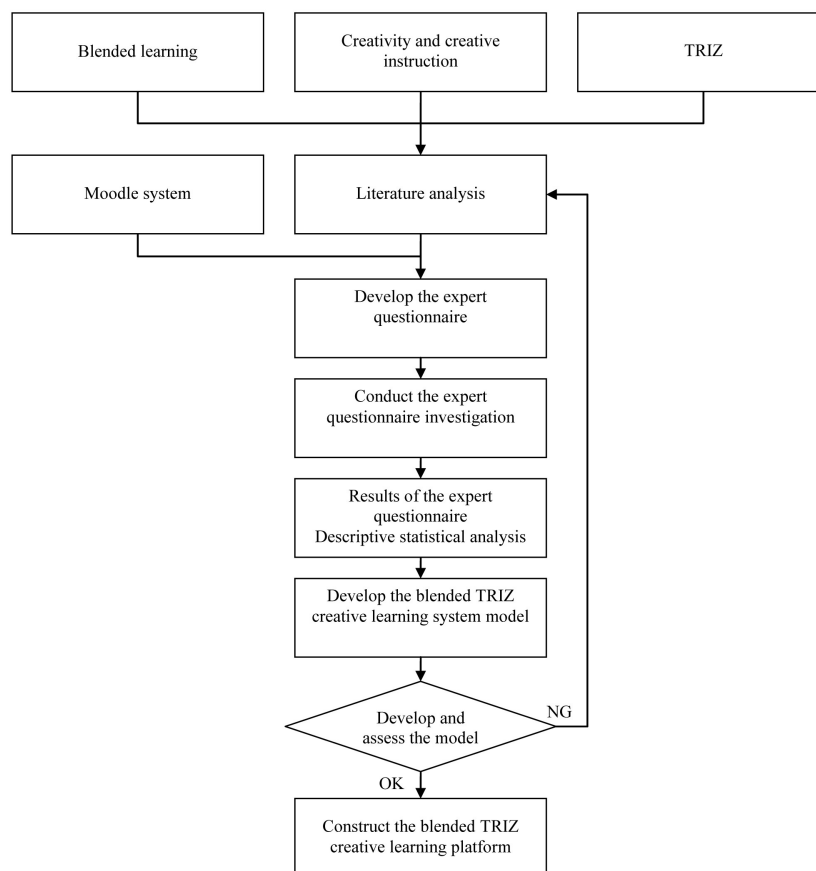
Fig. 2. Research flow framework diagram.

Table 4. Correlation of functions in blended creative learning platform

Elements	Blended creative learning system items	Platform function interface
Delineated purposes	• Conduct analysis of the target persons • Motivate the cultivation of creativity • Cultivate creative personality traits • Develop creative thinking capabilities • Create an instructional context that is lively, open, and conducive to creative behavior	• Introduction of the curriculum • Information in the curriculum • Content of the curriculum • Catalog of the instructional materials • Latest news
System design	• Learned content characteristics used to creatively use the existing knowledge • Quality of the digital instructional materials • Active learning that emphasizes the subjectivity of learners • Interactive learning that emphasizes bidirectional interaction between teachers and students • Simulated learning that emphasizes the application of knowledge • Accumulated learning that helps students engage in overall considerations for problems • Deal with individual differences and inspire students to develop sensitivity to issues • Use instructional media and creative instruction design adeptly • Administer creative and diverse instructional evaluation • Use creative instruction methods to inspire mental flexibility from the students • Emphasis on novel, flexible, and high-efficacy learning strategies and methods • Learning motivation for creative activities and the pursuit of creative learning objectives	• Curricular interaction (curricular discussion, online discussion, issue discussion, meeting halls) • Classmate information/group • Teacher lecture audiovisual files/ hyperlinks • Simulated classrooms • Online learning area / online testing area • Homework/reports/testing/exams • Information on scores • E-mail teaching assistants /common questions • E-mail • Reference books—can upload .htm files (embedded) • Videoconferencing/chat rooms
System mechanisms	• Organizational support and educational training conditions • Abandon the authoritative role for the instructor and encourage the students with an accommodating attitude instead • Respect any childish or even ridiculous questions from students • Appreciate student expression and praise student opinions • Avoid giving positive value judgments for student actions • When criticizing student opinions, explain the reasons for the criticism	• Student learning records (log-in, going to class, posting, discussion times, and reading times and pages read) • Questionnaires/voting area • Student information management area
System support	• Blended creative learning system functionality • Blended creative learning budget size • Blended creative learning basic infrastructure • Resources that can be used to develop blended creative learning	• System log-in and log-out • Database of instructional material content • Online support • Learning tools (online dictionary, calculator, schedule book)

learning process designed to enhance their educational accomplishments. This study uses the Moodle system as the platform construction system to plan the functions of the blended creative learning platform, as shown in Table 4.

This study uses the four main aspects of blended learning to develop the TRIZ creative learning model. It applies the function of an internal platform to achieve creative teaching design and uses the TRIZ theory as the method of creative teaching. Such teaching shares inventors' knowledge and experiences in order to trigger students' creativity and problem-solving abilities, lead them to engage in meaningful learning, enhance learning effectiveness, and contribute to more efficient creative R&D.

3. Research method

The methodology and administration in this study are explained as follows.

(1) Use literature analysis to engage in literature review.
(2) Summarize the items necessary for constructing the blended TRIZ creative learning system and platform.
(3) Develop the expert questionnaire.
(4) Conduct the expert questionnaire investigation.
(5) Conduct descriptive statistical analysis.
(6) Develop the model and content of the blended TRIZ creative learning system.
(7) Develop and assess the blended TRIZ creative learning model.
(8) Construct the blended TRIZ creative learning platform.

3.1 Literature analysis

Literature analysis is a research method based on a specific research purpose. By collecting related literature, such as market information, surveys

Table 6. Statistical analysis of expert questionnaire results

1. The purpose of developing the blended TRIZ creative learning platform	Mean
1 To cultivate students' creative abilities	4.57
2 To cultivate students' creative attitudes	4.43
3 To cultivate students' creative know-how	4.57
4 To overcome the limits in time and space for student learning	4.86
5 To create an instructional context that is lively, open, and conducive to creative behavior	4.29

2. The TRIZ application of the blended TRIZ creative learning platform	Mean
6 Should possess the TRIZ principle explanation	4.57
7 Should possess the TRIZ functions for defining technical contradictions (e.g., group discussion and brainstorming)	4.86
8 Should possess the contradiction matrix of the TRIZ	4.57
9 Should possess explanations of the 40 TRIZ invention principles	4.43
10 Should possess explanations of the TRIZ application examples	4.57
11 Should possess the reference literature of the TRIZ	3.57

3. The Blended TRIZ creative learning system design	Mean
12 Should have the function of active learning	5.00
13 Should have the function of interactive learning	4.86
14 Should have the function of accumulated learning	4.86
15 Should have the function of individualized teaching (e.g., emphasis of individual differences)	4.71
16 Can suitably use instructional media (e.g., instructional audiovisual files)	4.57
17 Can administer creative and diverse instructional evaluations	4.29
18 Can emphasize novel, flexible, and high-efficacy learning strategies and methods	4.43
19 Can pursue creative learning objectives	4.71

4. The Blended TRIZ creative learning platform mechanisms	Mean
20 Possess mechanisms for group support and educational training	4.71
21 Possess mechanisms to inspire students with an accommodating attitude	4.00
22 Possess mechanisms to appreciate student performance	3.86
23 Possess mechanisms for the timely praise of students	3.86

5. The construction of the blended TRIZ creative learning platform with a Moodle system	Mean
24 Should have the function of a bulletin board	4.57
25 Should have the function of a discussion area	4.71
26 Should have the function of a chat room	4.14
27 Should have the function of recording learning history	4.71
28 Should have the function of checking and analyzing test scores	4.29
29 Should have the function of curricular management	4.43
30 Should have the function of setting groups	4.14
31 Should have the function of homework and activities	4.71
32 Should have the function of creating test questions	4.29
33 Should have the function of downloading files	4.57

and reports, and industry dynamics, researchers can comprehensively and accurately grasp the research question. This study uses literature analysis to collect and organize the related literature for analysis, comparison, and composition. This paper aims to summarize the concepts or definitions commonly used by the literature for cross-referencing purposes in the hope of developing an initial understanding of this study.

3.2 Expert questionnaire survey method

The questionnaire survey is a type of survey research method used to discover existing facts and conditions. The most important purpose of the survey is to collect and accumulate basic data on the science education characteristics of a target group. This study develops the results of the literature analysis

into questionnaires, and the questionnaires themselves are divided into five types. the platform development objective, the TRIZ application, the system design, the platform mechanisms, and the construction of the Moodle system. Each questionnaire contains a total of 33 questions. A 5-point Likert scale ranging from 'highly agree' to 'highly disagree' is used to evaluate the extent to which the research subjects agree with the questions. The expert questionnaire survey is used to obtain in-depth information and to ensure the precision of the analytical results.

3.3 Research subjects

This study invited seven experts to participate in the expert questionnaire. Information on the experts is shown in Table 5. Their professional fields consist of

Table 5. Background information on experts and scholars

Item	Gender		Professional field					Number of years in instruction				Occupational title				Age		
	Men	Women	Innovation and creative instruction	TRIZ application	Mechanical engineering	Technological education	Blended learning	26-30 years	16-20 years	11-15 years	6-10 years	Professor	Associate professor	Assistant professor	Consultant/Lecturer	50-59	40-49	30-39
Number of people	7	0	5	2	2	5	4	3	2	1	1	4	1	1	1	4	2	1

innovation and creative instruction, TRIZ application, mechanical engineering, technological education, and blended learning. These areas fully cover the scope of this study. Each of the experts has at least nine years' teaching experience and they are thus able to provide comprehensive and professional suggestions for this study.

4. Results and discussions

Based on the research methodology and procedure, the results and discussions are illustrated in the following section.

4.1 Descriptive statistical analysis of the expert questionnaire

Descriptive statistical analysis was used to analyze the results of the expert questionnaire. With the exception of items 11, 22, and 23, the means of the items are all above 4.00 (i.e., between highly agree and agree), as shown in Table 6. These results show that the experts agree with the points summarized by this study. The purposes of the blended TRIZ creative learning platform are to cultivate the students' creative ability, resolve the constraints on the time and space of learning, and construct a vivid and open teaching context as learning platform. The multi-function platform of the Moodle system was used to construct the mechanism with group support and education training. The TRIZ theory was used to design the creative learning system of active learning, interactive learning, and cumulative learning. Moreover, the learning strategies and methods of teaching media characterized by novelty, flexibility, and high efficiency were used to achieve the objective of enhancing creative learning.

The mean of Item 11, for instance, is 3.57 (i.e., between agree and neutral). In this case, four experts showed neutral opinions. Because the platform is directed at the students of technological universities, an understanding of the TRIZ reference literature is unnecessary. Accordingly, the experts suggested that this item be listed as an extended learning item. The means of items 22 and 23 are 3.86 (i.e., between agree and neutral). One expert highly disagreed with the items because the expert believed that the platform itself did not have such functions. As a result, the expert recommended that teachers and teaching assistants use the platform mechanism to explore student discussion and administer question feedback from different perspectives. Bidirectional interaction and communication between the students and teachers should be used to appreciate the students' performance and give timely praise to the students. This point is the same as those made by other experts and is an item that must be noted if this study conducts a follow-up on experimental instruction.

4.2 Develop the model and framework content of the blended TRIZ creative learning system

4.2.1 The blended TRIZ creative learning system model

As shown in Fig. 3, the model of the blended TRIZ creative learning system is developed based on the results of the expert questionnaire analysis. The platform functions that should be possessed are systematically incorporated into the innovative course content design and the system mechanisms that should be possessed are used in conjunction with the TRIZ. Effective information technology is
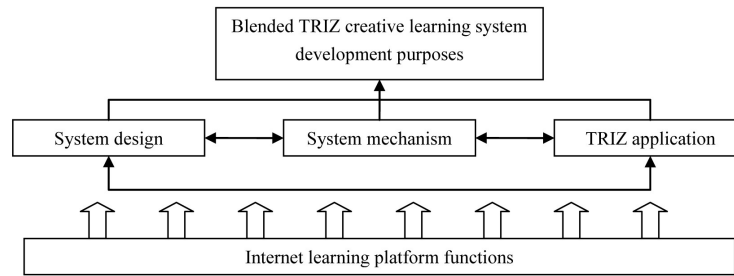
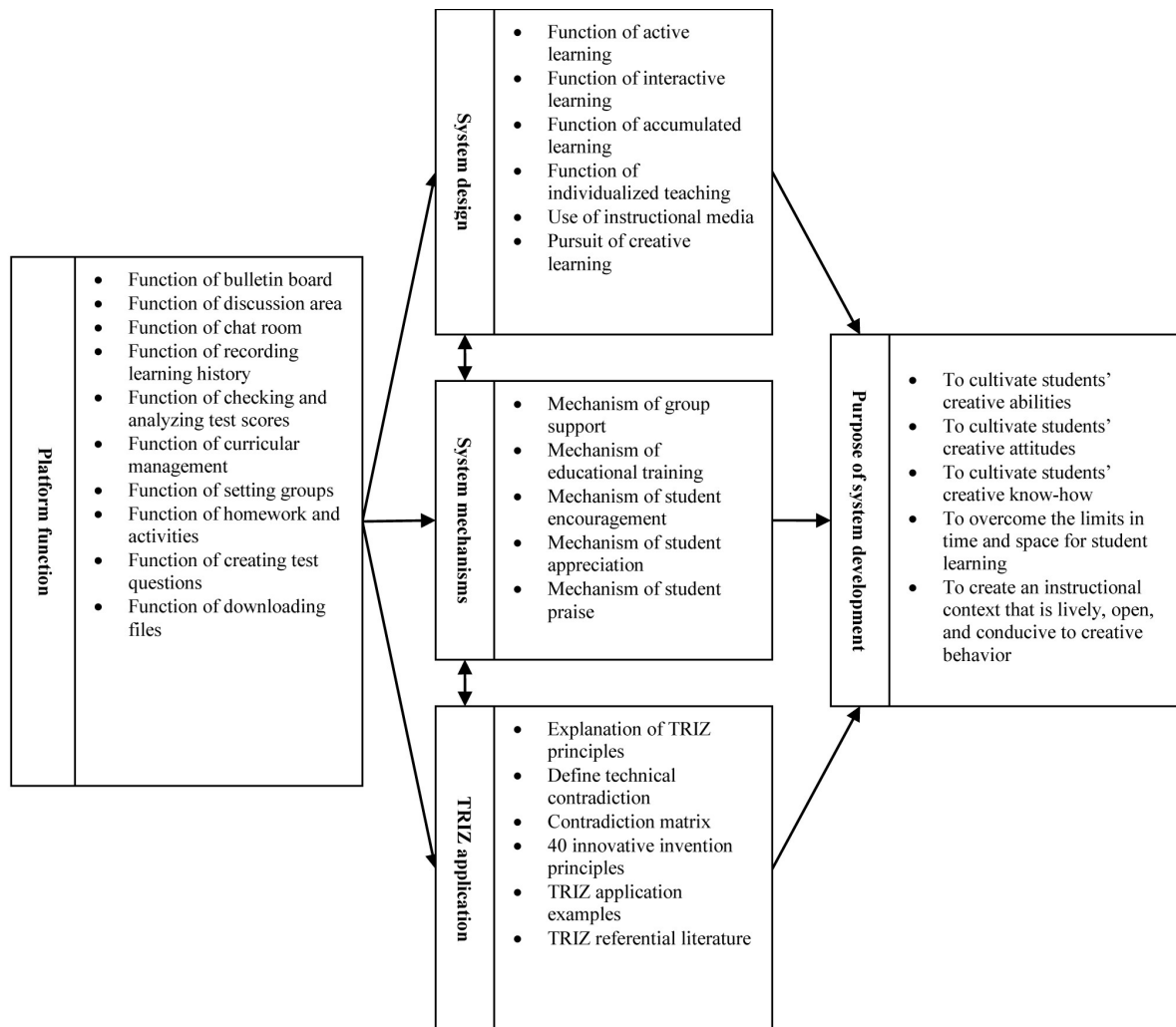**Fig. 3** Blended TRIZ creative learning system model.

Fig. 4. Blended TRIZ creative learning system framework content.

used to plan the creative learning model and to develop the system.

4.2.2 Content of the blended TRIZ creative learning system framework

In accordance with the results of the expert questionnaires, this paper develops the framework of the blended TRIZ creative learning system, as shown in Fig. 4. The overall considerations of this framework can hopefully help construct the blended TRIZ creative learning platform to raise students' creativity and research and development skills.

4.3 Development and assessment of blended TRIZ creative learning model

An assessment group (consisting of five people total: two professors, onw assistant professor, and two Ph.D. candidates) was formed in this study to assess and amend the developed model according to the aforementioned system model and framework con-
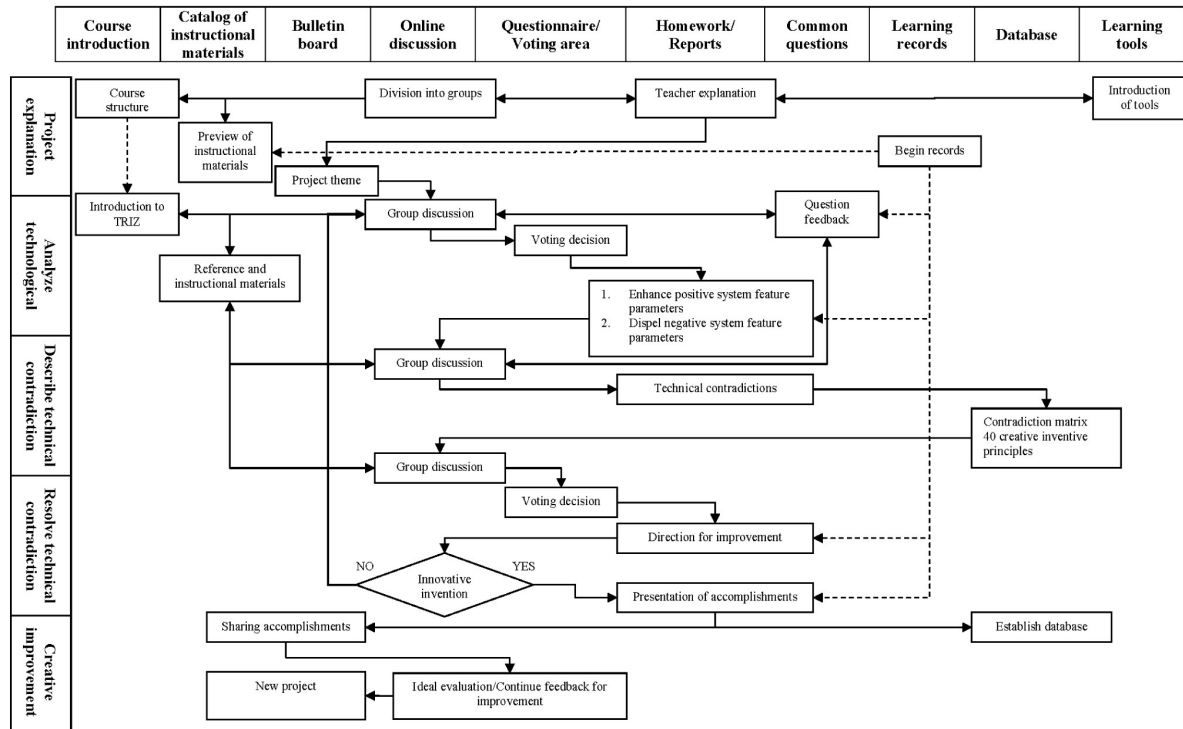
Fig. 5. Flow of operations in blended TRIZ creative learning platform.

tents for constructing blended TRIZ creative learning platform. After the model was assessed and amended according to the developmental assessment mechanism, the flow of operations of the blended TRIZ creative learning platform was developed (as shown in Fig. 5). The operating procedures were divided into five stages: 1) project explanation; 2) TRIZ—analyze technological system; 3) TRIZ—describe technical contradiction; 4) TRIZ—resolve technical contradiction; and 5) creative improvement. The explanations are given below:

Stage 1: Project explanation
The focus of this stage is on enabling students to understand how a project is conducted and to become familiar with the platform interface to increase the frequency and quality of online teacher–student interactions and to further increase the effectiveness of creative learning [14]. A creative design competition was held in this project implementation-based study. In the beginning, teachers introduced the operating interface, usage, project activities, and rules of competition of the 'blended TRIZ creative learning platform' to students via face-to-face instruction. The students could become familiar with the platform interface through actual operation. The online grouping of students was established, and the platform began to record students' learning records and interactive conditions to trigger group intelligence, reach group

consensus, and motivate group members to make efforts to achieve objectives during the cooperative process [17].

Stage 2: TRIZ—Analyze technological system
This is the first stage of the TRIZ theory. After each group completed the preliminary design of the project and practice, an online group discussion was held, and an analysis of the technological system was performed to evaluate the competition scoring criteria and performance test result of creative works. The discussion and analysis enabled students to master the system by understanding each part (sub-system) of its root problems. Moreover, students could learn two methods for changing characteristics of a technological system: (a) improving the feature parameters of a positive system, and (b) eliminating the feature parameters of a negative system [15]. The main purpose of this stage was to explain these two methods. This stage focuses on cultivating students' systematic thinking and understanding that it is easier and more effective to eliminate the cause of problems than to eliminate its effects. Such reasoning can help students trigger their creative thinking ability.

Stage 3: TRIZ—Describe technical contradiction
This is the second stage of the TRIZ theory. Students complete this stage by continuing the online discussions and uploading homework that

was started in the previous stage. Once students have identified the characteristics necessary to improve the system, this stage familiarizes them with the 39 feature parameters of the TRIZ, helps them understand that technical contradiction is the conflict taking place in a technological system, and enables them to identify the technical contradiction to be resolved. Because the technological system is partially improved, the corresponding parts may worsen [15]. The purpose of this stage is for students to provide a specific, written explanation on the conclusion concerning technical contradiction reached by the group discussion. This stage focuses on developing students' ability to analyze the technical contradiction in a technological system by understanding the connection among various systems.

Stage 4: TRIZ—Resolve technical contradiction
This is the third stage of the TRIZ theory. Once the technical contradiction was confirmed, students were instructed to use the TRIZ contradiction matrix to determine the most effective invention principles based on the referential materials of the platform database. The case sharing of the referential materials enabled students to become familiar with each invention principle and to establish the most appropriate invention principle to improve performance and remedy the disadvantages of the creative work. The students then wrote a report about the technical contradiction, the invention principle for resolving it, and the outcome after improvement. This stage focused on teaching students to use the TRIZ contradiction matrix and 40 invention principles to resolve technical contradictions and to improve the efficiency of creative R&D [15].

Stage 5: Creative improvement
This is the stage of publication and feedback. A launching ceremony was held to exhibit the creative works of each group. The ceremony included brief introductions to the projects and performance tests of the works. Five experts jointly reviewed the scoring criteria and provided positive feedback. The students could also observe the works of other groups to exchange knowledge and experiences. The production procedures of excellent groups were archived as the project example for a platform database to effectively manage and share this information [3].

The blended TRIZ creative learning platform constructed in this study proved effective at resolving the restrictions on time and space of learning [1], enabling students to learn to analyze a technological system, describing technical contradictions, determining the most appropriate problem-solving method, and improve the performance and remedy the disadvantages of their work [15]. The instructors were able to effectively control students' learning conditions and immediately provide them with assistance and feedback based on the platform learning records of groups and uploaded homework. This approach enabled students to become familiar with the TRIZ creative invention principles and complete the empirical work of creative design within the deadlines. The instructors could appreciate and admire the students' work. A students' creative invention database was then established to manage the knowledge obtained.

4.4 Construct the blended TRIZ creative learning platform
The flow of the TRIZ creative learning platform's operation was developed according to the completeness and feasibility of model development and framework contents of the model. The main webpage included four main functions: 1) outline; 2) latest information; 3) activities; and 4) system management. The internet platform was used as the medium of knowledge sharing and communication to trigger group intelligence, reach group consensus, and motivate group members to achieve their objective [18]. Each of the functions served to reach the expected effect of this study and develop a platform that would cultivate students' creative ability, resolve the restrictions on time and learning space, and create vivid and open teaching contexts.

5. Conclusions and Suggestions

This study transformed traditional passive teaching into active student learning. It integrated the TRIZ theory to construct the blended TRIZ creative learning platform in order to achieve the objectives of this study. The results of this study summarized the importance of and determined the correlation between blended learning, creative teaching design, and platform functions. Through using the functions of the internet learning platform, this study constructed a blended learning environment to effectively resolve the restrictions of time and space on student learning. The students were also able to cultivate positive attitudes toward active and interactive cooperative learning. Meanwhile, dealing with the problems and exchanging feedback during group discussions triggered the students' boundless creative potential. Additionally, in order to foster creative learning, this study constructed a learning platform with group support and an education training mechanism in which teaching media and the TRIZ theory were used to design the creative learning systems of active learning, interactive learning, and cumulative learning.

Furthermore, the blended TRIZ creative learning system was created based on required items to be included in the constructed platform. These required items contain five main frameworks: system development, system design, system mechanism, TRIZ application, and platform functions. Finally, the blended TRIZ creative learning platform constructed in this study possessed the characteristics of blended learning and was able to effectively resolve the restrictions of time and space on student learning, enable them to share the knowledge and experiences of inventors through learning and applying the TRIZ theory, and trigger their creative and problem-solving abilities. The learning records provided by the platform to control the students' learning conditions, which allowed teachers to provide the students with assistance and feedback to effectively improve their creative and R&D abilities.

Some suggestions are proposed for future studies as follows. First, the teaching materials of blended TRIZ creative learning should be developed. Teaching materials for blended TRIZ creative learning can be designed based on the aforementioned findings. Such materials can support more vivid and creative teaching methods. Their content can be used to trigger students' interest in learning and improve their creative attitudes and abilities. Second, teaching experiments using the blended TRIZ creative learning platform can be conducted. The blended TRIZ creative learning platform constructed in this study included system development, system design, system mechanism, TRIZ application, and platform functions. Finally, the model was amended based on the model development assessment mechanism, which can provide a comprehensive consideration. Thus, this learning platform may be employed to conduct more teaching experiments with various levels of students and a larger scale of participants and to collect more relevant information to perform analyses on learning effectiveness in the future.

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