

The development of a blended emergent research training program for clinical nurses (Part 1)

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Abstract

Background

Nursing research training is important for the improvement of nursing research competence of clinical nurses. High-quality development is crucial for a good nursing research training program. Therefore, the objectives of this study are: (1) To develop a blended emergent research training program for clinical nurses based on a needs assessment and related theoretical framework; (2) To describe and discuss the uses and advantages of the ADDIE model (Analyze, Design, Develop, Implement, Evaluate) in the instructional design and potential benefits of the blended emergent teaching method.

Methods

This intervention development study adopted mixed-methods design. The ADDIE model (Analyze, Design, Develop, Implement, Evaluate) was followed to develop the research training program for clinical nurses based on the limitations of current nursing research training programs, the needs of clinical nurses, and the theoretical foundation of blended emergent teaching.

Results

In this study, a theoretical framework of blended emergent teaching was constructed to provide theoretical guidance for the development of training program. Following the ADDIE model, a blended emergent research training program for clinical nurses to improve nursing research competence was developed based on the needs of clinical nurses and the theoretical framework of blended emergent teaching.

Conclusions

The nominal group technique could effectively identify learners' common needs and priorities. The ADDIE model is a valuable process model to guide the development of a blended emergent training program. Blended emergent teaching is a promising methodology for improving the learner's learning initiative and educational outcomes. More empirical studies are needed to further evaluate the blended emergent teaching to promote the development of related theories and practice in nursing education.

1. Background

Nursing research capacity refers to the ability to conduct nursing research activities in a sustainable manner in a specific context, and it is normally used at a non-individual level [1]. Nursing research capacity is critical for the improvement of the nursing discipline; as well as for positive nurse, patient and healthcare system outcomes [2]. Nursing research capacity requires not only individual nursing research

competence (NRC), but also the contextual factors that exist to support and sustain research activities [3]. NRC refers to the individual ability to conduct nursing research activities (i.e., identify problems and formulate research questions, search and critically review literature, design and implement research, analysis data, and write research reports) [4]. Therefore, NRC is crucial to build nursing research capacity, and it is a prerequisite for contextual factors to play a role in nurturing the group/organization/discipline's overall nursing research capacity [1, 5, 6].

With the development of the nursing discipline and evidence-based nursing practice, NRC is increasingly important for clinical nurses [7, 8]. Both the nursing discipline and evidence-based nursing practice require high-quality clinical nursing studies, which generate further clinical nursing knowledge and evidence. Clinical nurses are crucial for clinical nursing research because they provide care to patients directly. Clinical nurses are more likely to put forward research questions most relevant to clinical practice, and they are in advantageous positions to recruit patient and collect data [9]. Moreover, clinical nurses must be equipped with adequate NRC which is necessary for the evidence synthesis and evidence-based nursing practice [6]. While contextual supports (e.g., time, resources, funding, supportive institutional culture, etc.) are necessary to successfully conduct high-quality nursing clinical studies and evidence-based nursing practice [10], the NRC of clinical nurses is a prerequisite for contextual supports to play their supportive roles in nursing research capacity building [1].

Low NRC of clinical nurses is an identified problem worldwide, which hinders nursing discipline development and evidence-based nursing practice [6, 11]. Training programs have been recognized as an important approach to improve NRC, especially for clinical nurses who do not always have the opportunity to further their academic education in universities [11–13]. For clinical nurses with some experience in nursing research, research training could provide them with opportunities to systematically learn or review research knowledge and skills. For clinical nurses without any research experience, research training is a good introduction of nursing research, which could help them explore their interest in nursing research [14].

We did a systematic literature search and review and found fourteen studies that mainly focus on the effectiveness of research training program for clinical nurses [5, 14–17]. However, there is a lack of effective research training programs for clinical nurses, and related intervention studies are limited. They were conducted in China (10 studies), England (2 studies), Denmark (1 study), and Spain (1 study). While they offer an important starting point for the study of research training for clinical nurses, these studies have several limitations. Firstly, the evidence they provide is limited because of the severe limitations of the study designs (e.g., no control group, no consideration of contamination, the use of incorrect statistical methods, etc.). Furthermore, there was no specific description of the theoretical framework, which provides the necessary theoretical guidance for the training program development; nor were there specific descriptions of the development processes of the research training programs. No significant, innovative strategies targeting the nursing research competence of clinical nurses could be identified in any of these research training programs [5, 14–17]. These limitations are aligned with the unsatisfactory outcomes in these intervention studies. In sum, there is still a paucity of research that: (1) is focused on

the development of innovative research training programs for clinical nurses, and (2) offers convincing empirical studies to evaluate the effectiveness of such research training programs on clinical nurses. Therefore, the goal of the entire research project is to innovatively develop and evaluate an appropriate, systematic and effective research training program for clinical nurses to improve NRC. This paper illustrates the development of the training program for this research project. The evaluation of this training program will be described in a separate intervention evaluation paper. (The evaluation paper is under review and could be provided upon the request of reader.)

Based on the literature review and a focus group interview of clinical nurses in this project, the limitations of previous nursing research training programs and corresponding solutions are proposed (for more details, see the “*A(Analyze)*” component of Sect. 2. Method; Sect. 3. Results; and Table S1). Based on the proposed solutions in Table S1, a blended emergent research training program for clinical nurses was proposed as a potentially effective way to improve the NRC of clinical nurses, based on (1) a needs assessment, and (2) the theoretical framework of blended emergent teaching. Blended emergent learning is a combination of emergent teaching and blended learning (see more details under the “*A(Analyze)*” component of Sect. 3. Results). Emergent teaching is a learner-centered teaching process in which educators and learners dynamically develop and explore knowledge together [18]. Blended learning is a blend of online learning and face-to-face learning. Blended learning helps to address many of the limitations of learning when it is entirely online (e.g., the restriction on the relationship-building) or entirely face-to-face learning (e.g., the restriction on flexibility) [19].

Objectives of this study:

The primary objective of this study was to develop a blended emergent research training program for clinical nurses based on a needs assessment and related theoretical framework. The secondary objective was to describe and discuss the use of the ADDIE model (see more details in Sect. 2. Method) in the instructional design and potential benefits of the blended emergent teaching method on nursing education. (The evaluation of this training program will be described specifically in a separate intervention evaluation paper which is under review.)

The context of this study

This project was conducted in China in 2017. In China, more than 75% of nurses do not have a bachelor’s degree or above. Moreover, even among university-educated clinical nurses, the majority of these nurses do not receive research education as an essential part of their formal curriculum. Instead, short lectures, conferences, workshops, short-term (3–5 day) training programs, and journal clubs are the most common methods for disseminating research training to clinical nurses. Most of these training programs are non-systematic, time-limited, and teacher-centered [17].

The participants in our research project were clinical nurses with bachelor’s degree or master’s degree who have some limited knowledge of nursing research. Most participants did not receive any formal and

systematic research education as part of their university educations. More details could be found in the notes of Table S1 and Table S2.

2. Methods

This intervention development study used a mixed-methods design. Quantitative and qualitative data were all collected in this study for the intervention development. We used ADDIE (an instructional design paradigm) (Fig. 1) [20] as the process model for training development. ADDIE is appropriate for effectively developing educational products and learning resources [20]. However, it has received limited attention from nursing educators and nursing education researchers. The ADDIE model includes A (Analyze), D (Design), D (Develop), I (Implement), E (Evaluate) stages. E (Evaluate) includes formative evaluation and summative evaluation. The ADDIE model is an iterative process model, whereby a program developer can switch to stage E (Evaluate) at any time when necessary, and then return to any other steps (A, D, D, I) based on the results of the evaluation. The main elements of every step in this study are shown in the Fig. 1.

A (Analyze)

Characteristics of learners were analyzed and the results were considered during the whole ADDIE process. A focus group interview of 10 clinical nurses and a broad literature review were used to identify the common types and limitations of current nursing research training programs, and to propose corresponding solutions. The theoretical framework of these training programs was analyzed. The nominal group technique, which is a common consensus building method [21], was used as a needs assessment to identify learners' common training needs and training priorities. The process and specific description of the nominal group technique session are shown in Figure S1 and the note of Table S2, respectively [21]. The purpose statement and learning goals of the training were proposed based on the results of the nominal group technique session. All resources needed for training were also analyzed.

D (Design)

Task inventories logically organized the learning goals, performance tasks required to achieve each learning goal, and the prerequisite knowledge and skills for completing the performance tasks (an example is shown in Figure S2). These task inventories were critical for appropriately designing the instructions and for helping learners to effectively construct the knowledge and skills required to achieve the learning goals. [More details on Task Inventory could be found in the ADDIE guidance book[20].] The task inventory of every training unit was designed based on the results of the purpose statement and learning goals (Table S3) in the first step (*Analyze*).

In this blended emergent training program, Predefined Contents were the contents prepared by the research group based on the needs assessment (see results in Table S2) of clinical nurses before the training program began, compared to Emergent Resources which emerged from the training process (Fig. 2). The Predefined Contents of this training program; including learning goals, performance

objectives, assignments, and learning materials (videos, handouts, and literature); was designed based on the task inventory of every unit, nursing research textbooks, and pedagogical theories and methods [20, 22]. The training process model (Figure S3 in the additional file) was designed based on the framework of blended emergent teaching (Fig. 2) to guide the implementation of the blended emergent training program. The planned training schedule of the training program (Table S4 in the additional file) was designed based on the complexity of the unit contents, the results of the nominal group technique session, and the training process model.

D (Develop)

An online learning environment (i.e., an interactive online platform) was developed. Unit assignments, learning videos, and handouts were developed, and appropriate reading materials were selected, based on the prerequisite knowledge and skills of the task inventories (Figure S2). Furthermore, the formative evaluation questionnaire and the summative evaluation instruments were selected or developed based on the purpose of this study.

I (Implement)

We implemented the research training program according to the planned training schedule and training process model (see Table S4 AND Figure S3 in the additional file). During the training implementation process, we could re-enter the other stages (A, D, D, E) again to dynamically and iteratively refine the training based on the Emergence of new data (Fig. 2) in emergent teaching and feedbacks from the formative evaluation (E).

E (Evaluate)

The formative evaluation is the central and ongoing “Evaluate” component of ADDIE, where the results of the ADDI components are evaluated to further refine the developing training program (See Fig. 1). For example, at D (design) and D (develop) stages, a research group meeting was organized to evaluate the results of the D (design) and D (develop) stages. At I (implement) stage, the formative evaluation questionnaire was used to regularly evaluate each learner’s satisfaction and suggestions regarding training contents, methods, and time schedule. Meanwhile the online interaction records, learners’ online learning processes and behaviors (monitored by the online platform), and observations from the face-to-face emergent seminars, were all analyzed as part of the formative evaluation for refining the training. The summative evaluation (reported in detail in the other publication from this project) was used at the end to evaluate the overall effects of the blended emergent research training program for clinical nurses.

3. Results

A: Analyze

Learners to be included in this study were all clinical nurses, with a bachelor’s degree or master’s degree, having more than one-year of working experience, and were capable of using smartphones and laptops.

Based on the results of the data collected in a literature review and a focus group interview of clinical nurses, the common types, limitations of previous nursing research training programs and corresponding solutions are listed in Table S1. All solutions proposed were considered during the development of the training program. Based on the corresponding solutions, a blended emergent research training for clinical nurses based on the needs assessment and related theoretical framework was proposed as a potentially effective way to improve the research competence of clinical nurses.

In order to provide theoretical guidance for the program development, a theoretical framework of blended emergent teaching was constructed based on a scoping and critical review of the literature related to emergent teaching (e.g., [18, 23–25]) and blended learning (e.g., [19, 26]). In the framework (Fig. 2), “Predefined Contents” refers to the contents predefined and developed based on the literature review and the learners’ needs (i.e., the results of the nominal technique group session). After the Predefined Contents are presented to the learners, there would be interactions among learners, learning resources, peers, and teachers [24]. During the interaction process, emergent resources (predictable and unpredictable) would emerge as the output of these interactions [27]. Predictable emergence refers to the emerging process which could be predicted. For example, after learners master pre-defined knowledge content about quantitative and qualitative research, we could predict that the learners could differentiate between these two types of studies. Unpredictable emergence involves the emerging processes which cannot be predicted before they happen. For example, after the discussion of an after-class assignment, some unexpected questions were proposed by learners. The analysis, identification, and use of valuable emergent resources (e.g., common mistakes made by learners, good examples provided by learners in the discussions, and good questions deserving in-depth discussion) are crucial to emergent teaching [18]. Emergent resources could, in turn, be used as the predefined contents in further trainings.

Training needs and priorities identified are shown in Table S2 and were considered during the D (Design) stage. The purpose of this training program was to improve the research competence of clinical nurses. Learning goals are shown in Table S3. Resources identified as being required for the training program were: Content Resources (e.g., textbooks, literature), Technology Resources (e.g., smartphones, laptops, interactive online platforms), Instructional Facilities (e.g., rooms), and Human Resources (e.g., video makers, professionals, training assistants).

D: Design

The task inventory of every unit guided our systematic instructional design. A copy of the task inventory for every unit was also provided to all participants for better learning. One example of the task inventory designed is shown in Figure S2. Learning goals, performance objectives, and corresponding assignments were designed for every unit. One example is shown in Table S5 in additional file. Learning materials of every unit were designed based on the task inventory of the unit. The specific training program’s process model (Figure S3) and the planned training schedule (Table S4) were provided in the additional file.

D: Develop

The interactive online platform was developed for online learning, communication, and interaction. The platform included front-end and back-end management. Every learner had a unique username and password (these inputs were set by the user and were confidential) to log on to the front-end (i.e., the user interface) of the platform. Every member of the research group had a unique account to log on to the front-end display and to have access to back-end management of the platform. The front-end of the platform included a “course” module (for learning files provided to learners), a “comments” module (for learners to post their comments on this research training and learning materials), a “questions” module (for learners to propose and discuss their questions related to the learning materials), a “notes” module (for learners to make synchronous notes while learning the “course” module), and a “community” module (that allowed: (1) for trainers to post lead-in questions and after-class assignments; (2) for learners to post their responses to the questions and assignments; and (3) for learners to discuss and interact with others). On the back-end of the platform, teachers could adjust the front-end display of the platform, post notices, upload learning materials, and track every learner’s learning behaviors and process.

Learning materials (videos, handouts, and literature) were developed or selected and improved by the research group. The formative evaluation questionnaire was developed by the research group. This questionnaire was used to evaluate each learner’s satisfaction regarding the training contents, methods, and time schedule of the units after each face-to-face emergent seminar in the training program. For summative evaluation, the Research Competence Scale for Clinical Nurses (RCSCN), Chinese Version of Critical Thinking Disposition Inventory (CTDI-CV), and a training satisfaction questionnaire were selected or developed as the instruments. More specific information about these study materials will be found in the other evaluation paper.

I: Implement

The three-month training program was implemented according to the training process model, the planned training schedule (Table S4 in additional file), and formative evaluation feedbacks. The actual training schedule (Table S6 in additional file) included four types of training activities: online courses, practice modules, emergent seminars, and a simulation project. (1) Predefined Contents of the unit were uploaded as the online course for learners. After learning the online course module of the unit, the learners would respond to the unit’s open-ended assignments, propose concerned questions, and discuss with trainers and peers in the online “community” module. (2) Practice modules were completed in a room with computers and a campus internet connection in order to train clinical nurses to use databases and software commonly used in nursing research. (3) Emergent seminars were used for group learning and discussion activities organized based on emergent topics. The emergent topics were identified and proposed by the research group through the review and analysis of the interaction records in the online “community”. There were valuable emergent resources (e.g. common mistakes made by learners and good examples and questions related to nursing practice and research) emerging from the interaction in the training. Trainers identified and used these emergent resources as learning materials in the training. (4) The incorporation of the simulation project was proposed and developed based on the learners’ feedback (collected at the fourth week of the training program), when learners shared that it was “easy to

forget the contents learned before and we cannot make all learned contents concrete". A two-day simulation project at the end of the training program (Table S6 in the additional file) was implemented to simulate all steps of the research process, in order to review the key knowledge and skills learned in the training and make them concrete. The simulation project is also an output of emergent teaching which is learner-centered and flexible.

E: Evaluate

The data for formative evaluation were analyzed and were used for improving the training before and during the I (Implement) stage. For example: feedback provided by the users after using the trial version of online platform were used to improve the online platform before the I (Implement) stage; the simulation project was proposed and developed based on the feedback from the formative evaluation during the I (Implement) stage, in order to improve the training. By the end of the study, the training program showed positive effects on nursing research competence and critical thinking of the clinical nurse participants. The summative evaluation will be explained in more detail in the separate evaluation research paper.

4. Discussion

This study illustrates the specific process of developing a blended emergent research training program using the ADDIE model. ADDIE is not only useful for systematic instructional design in predefined teaching; our study shows that it is also crucial for good instructional design in blended emergent teaching. Firstly, ADDIE is a systematic method to develop the predefined contents of blended emergent teaching. Secondly, the ADDIE model and blended emergent teaching is aligned well because both of them are iterative [18, 19]. When unpredictable emergence occurs in blended emergent teaching, the teacher could turn to any steps from I(implement) based on the needs of learners. Furthermore, formative evaluation in the ADDIE model also adheres to the dynamic and learner-centered characteristics of emergent teaching which emphasizes the learners' needs and formative evaluation and reflect the learners' need dynamically [18, 19].

This study has positive implications for educators who want to use the ADDIE model to design training programs, especially blended emergent education programs. Still, as ADDIE is a macro instructional design model, educators should consider the specific contexts of their own education programs while implementing the model. In this study, we effectively identified learners' common needs and priorities for the specific context of our study by using nominal group technique. This technique is an effective method for obtaining group needs and generating priority information. Nominal group technique has been successfully used in other pedagogical research to identify the requirements and priorities of learners and teachers [28, 29]. This paper also illustrates how to develop a training program based on an initial needs assessment and a related theoretical framework. Both are critical for the development of well-founded, systematic, and effective training programs.

Emergent teaching is the core idea of the training program in this study. Emergent teaching is the outcome of critical reflection on the process and the outcomes of predefined teaching. Predefined teaching is a teacher-centered teaching method commonly used in traditional education programs in which all the contents are constructed by teachers according to their own ideas and experiences, and the teaching process is pre-designed and fixed [23]. Compared to predefined teaching which focuses mostly on performance objectives, emergent teaching focuses more on the learning process. One primary purpose of emergent teaching is to improve the student's learning ability using personalized learning strategies [24]. Blended learning is the blend of online learning and face-to-face learning [19]. The flexibility of the blended learning method enables the personalization of the educational material according to students' needs that emergent teaching calls for.

A theoretical framework of blended emergent teaching (Fig. 2) was developed based on the literature closely related to emergent teaching and blended learning [18, 19, 23–25]. In blended emergent teaching, the full use of emergent resources is an iterative process which could help learners to cultivate the habit of inquiry, meet students' learning needs [30], and solve their concerned questions to master knowledge and skills better. This iterative process also embodies the characteristics of learner-centeredness, dynamic processes, and creativity of emergent teaching [23].

In our framework for the training program, the blended learning method (online and face-to-face learning) created an environment conducive to emergent teaching. Online learning provided the learners with resources, space and time to learn prerequisite knowledge and skills needed for better interactions and emergence. Furthermore, the interactions in online learning are recorded and shown as texts. With blended learning, educators have more time to analyze the texts to identify, organize, and use valuable emergent resources better. Emergent resources can also result from face-to-face learning. However, face-to-face learning proposes higher demands on educators' sensitivities to valuable emergent resources, as the interactions in face-to-face learning happen in a short time as oral conversations. In emergent teaching, face-to-face learning provided opportunities for learners and educators to build close relationships and effectively communicate face-to-face. These opportunities are crucial for positive interaction to give rise to better emergence [19]. The training program developed based on the framework showed positive effects in the summative evaluation, supporting the practicability and rationality of the theoretical framework.

The theoretical framework of blended emergent teaching (Fig. 2) proposed in this study can contribute to the development of theory related to blended emergent teaching. It provides a theoretical framework not only for our intervention, but also for the further development of other blended emergent education programs. Considering most works on emergent teaching prior to this study were limited to a discussion on the theoretical level, this framework could support more empirical intervention studies on blended emergent teaching, providing stronger evidence to evaluate the theoretical framework and promote the development of related theories.

Furthermore, the blended emergent research training program for clinical nurses developed in this study could also be used in the future as an effective research training program for clinical nurses. Compared to nursing research lectures, workshops, journal clubs, and short-term trainings [5, 15], this training is more suitable for clinical nurses with various levels of research experience. Our program could meet such nurses' needs better, as it includes comprehensive and multilevel contents of nursing research and is developed based on learners' needs. Compared to the one-year traditional university research courses which include face-to-face classes, lectures, and reading materials [14], our training is more suitable for clinical nurses as they can learn the prerequisite research knowledge and skills online at their own pace. Furthermore, the cases selected in the training are closely related to clinical nursing, so the cases may be easier to understand for clinical nurses than research training programs non-specific to clinical nursing research. In this training, the use of emergent resources created by learners is then used to help these learners master research knowledge and skills better. By using their own materials, learners can see how they have personally contributed to the training program, which can promote learner engagement [23]. In the summative evaluation, the blended emergent research training for clinical nurses showed positive effects on not only research competence but also critical thinking of clinical nurses. Therefore, more studies are needed to further substantiate the benefits of the blended emergent research training for clinical nurses and the positive impacts of blended emergent teaching on nursing education.

Strengths and limitations

This training program was developed following the ADDIE (Analyze, Design, Develop, Implement, Evaluate) model. It was developed based on the limitations of current nursing research training programs, the needs of clinical nurses and the theoretical foundation of blended emergent teaching, which could meet the learners' needs better. This study was conducted in a specific context (e.g., the participants are the clinical nurses holding a bachelor's degree or a master's degree from a tertiary hospital), the specific conditions of contexts should be considered when this training program was used in other contexts.

5. Conclusion

The ADDIE model is appropriate and effective to guide the development of a blended emergent training program. Blended emergent teaching, which is flexible and learner-centered, has potential benefits to improve the learner's learning initiative and learning outcomes. However, its related research and practice are still limited to nursing education. Therefore, blended emergent teaching should be further explored, studied, and adopted in other nursing education programs. The theoretical framework of blended emergent teaching constructed in this study could be used to guide the development of blended emergent education programs. This study developed a practical and well-structured blended emergent research training program based on an initial needs assessment, iterative literature search and review, and a relevant theoretical framework. This program could be used in research education for clinical nurses to improve their research competence.

Declarations

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Author contributions

QC: Conceptualization, Methodology, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing;

ZL: Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing;

ST: Conceptualization, Project administration;

CZ: Investigation, Data Curation;

AC: Writing - Review & Editing;

SJ: Data Curation, Writing - Original Draft, Writing - Review & Editing;

CH: Conceptualization, Investigation, Writing - Review & Editing;

JX: Methodology, Data Curation, Project administration, Writing - Review & Editing.

ALL authors approved the final manuscript.

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Availability of data and materials

The dataset used in the current study can be made available by the corresponding author upon reasonable request.

Ethics approval and consent to participate

Ethical approval was provided by the Institutional Review Board of Behavioral and Nursing Research in the School of Nursing of Central South University (No. 2017033). The methods were carried out in accordance with the *ADDIE Model for Educational Program Development and Guidance on How to Develop Complex Interventions to Improve Health and Healthcare*. All participants provided written consent after being given the full information of the study and having their questions answered.

Competing interests

The participants have given permission in the consent form regarding publishing some of their experience-related information.

Competing Interest

Not interest to disclosure.

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Figures

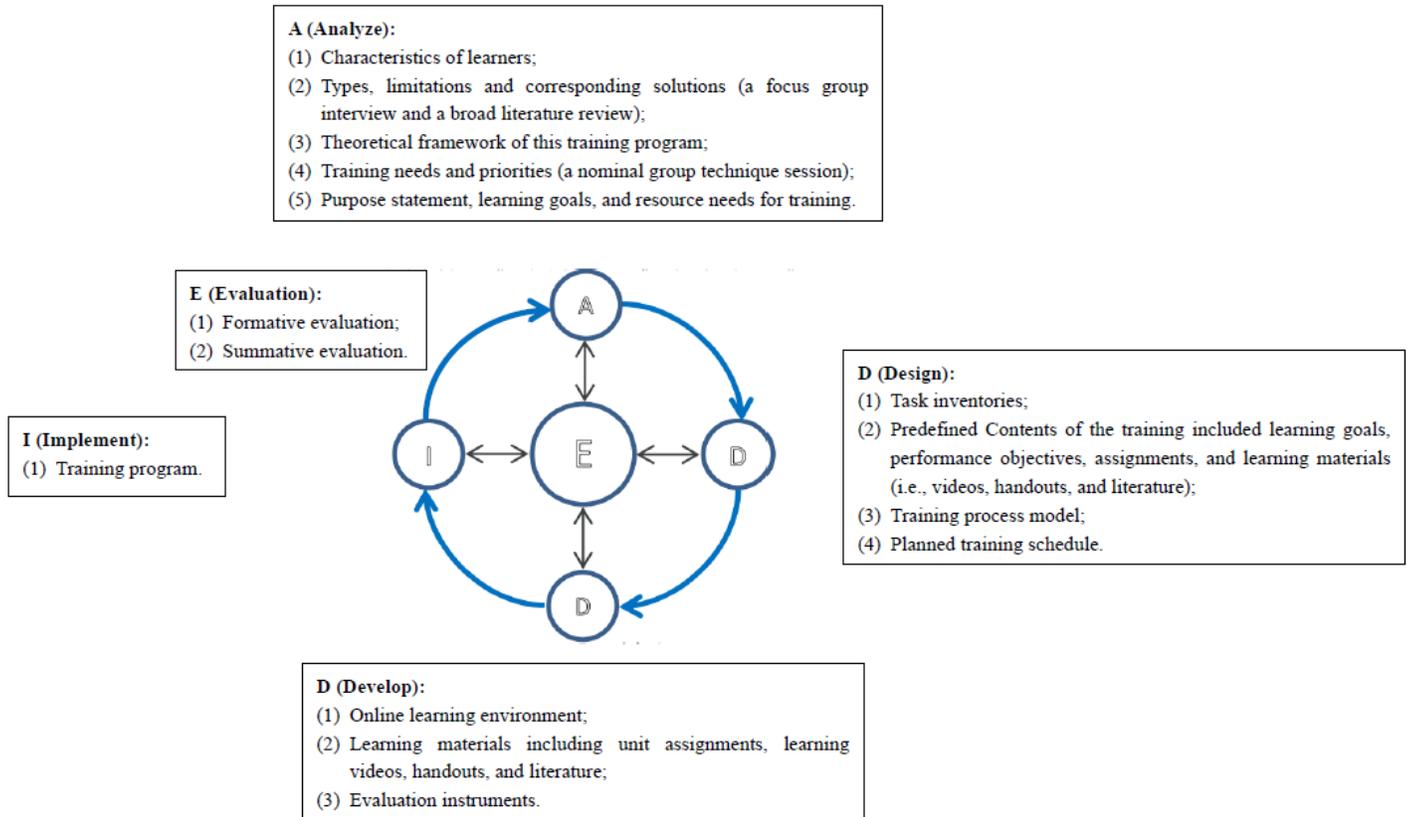


Figure 1

ADDIE model and main elements in each step in this study

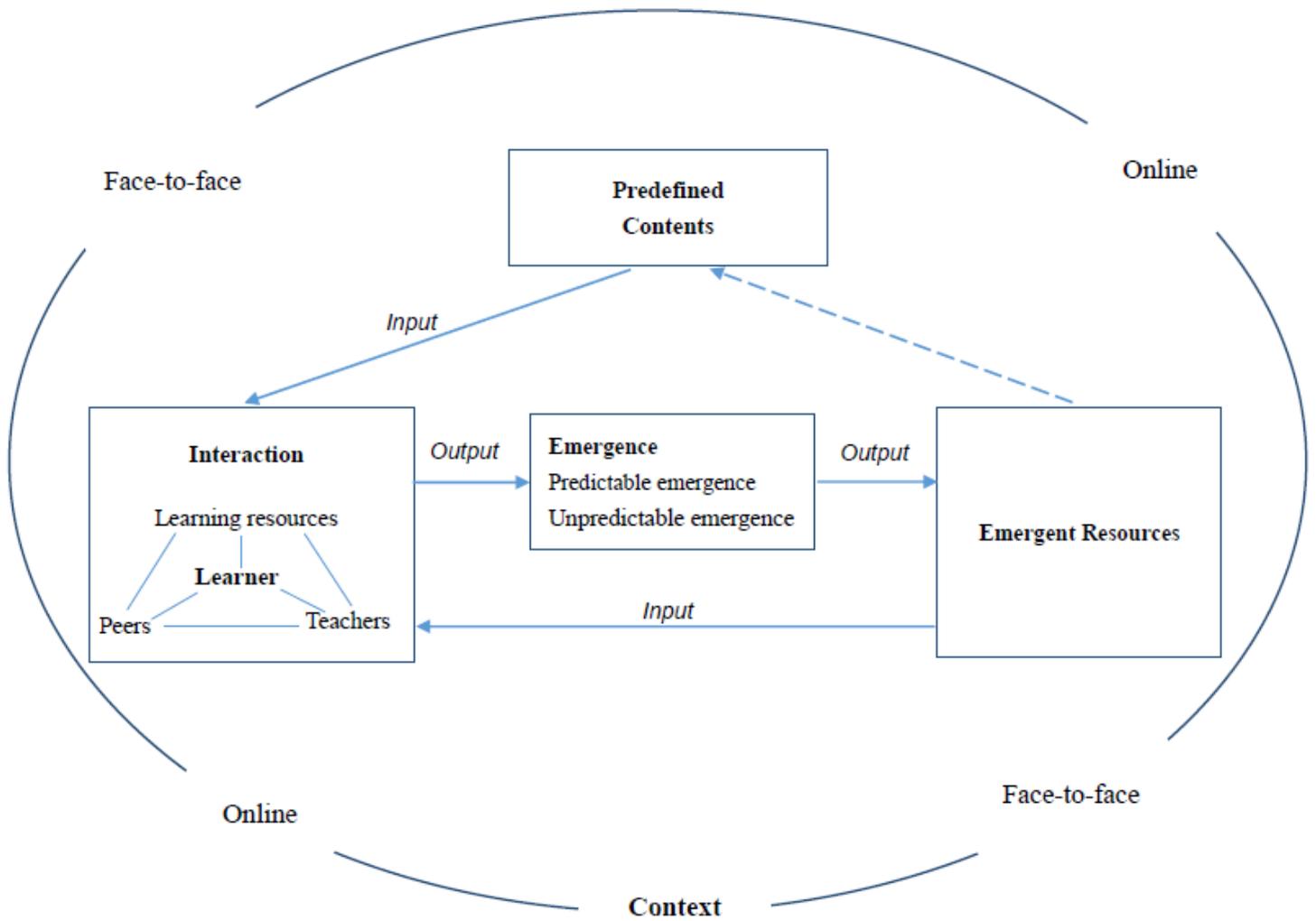


Figure 2

The theoretical framework of blended emergent teaching

Supplementary Files

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- [TablesS1.pdf](#)
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