

The Curriculum Development of Instructional Design for Preservice Special Education Teachers

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Abstract

There is an urgent need for pre-service special education teachers to improve their teaching design ability. This study aimed to develop a curriculum for enhancing the instructional design ability and evaluate its effectiveness. The sample comprised 32 junior preservice special education teachers from Chongqing Normal University. The researchers employed a research and development approach to develop the curriculum and the process, including four stages: 1) basic information study; 2) curriculum development; 3) curriculum implementation; and 4) curriculum evaluation and improvement. The research results were found as follows:

1. After the curriculum implementation, the instructional design ability of preservice special education teachers was higher than before.
2. The instructional design ability of preservice special education teachers had been enhanced before, during, and after implementing the curriculum.

These findings underscore the significance of targeted curriculum interventions in bridging the gap between theoretical knowledge and practical application, ultimately fostering more effective instructional practices among preservice special education teachers.

Keywords: Curriculum Development; Instructional Design Ability; Preservice Special Education Teachers

Introduction

Preservice special education teachers are defined as apprentice educators enrolled in a specialized training program tailored to special education, diligently striving to obtain certification as qualified special education instructors. The process of improving teachers' instructional design ability requires efforts not only in the in-service process, but also in the pre-service stage (Yu, 2010). Essential to achieving effective teaching is the adherence to correct operational procedures and fundamental norms in instructional design (Evans, 2021). This imperative is even more pronounced in the context of special education, where the unique characteristics of children with developmental disabilities elevate the demand for adept instructional design abilities among educators (Forsling, 2019; Thorius, 2016). Despite this demand, pre-service special education teachers often confront challenges in applying theoretical knowledge to instructional design when addressing diverse disabilities (Hammond, 2006). This deficiency hampers the integration of professional expertise into instructional design practices (Brown & Green, 2021), resulting in various issues such as inaccurate analysis of instructional content and learners, as well as a misalignment between instructional content and objectives (Hardré & Kollmann, 2013).

In recent years, the landscape of special education has witnessed a growing recognition of the critical role played by preservice teachers in fostering inclusive learning environments for students with diverse needs (Massouti, 2021; Robinson, 2017). However, despite concerted efforts to enhance preservice teacher education programs, gaps persist in effectively preparing these educators to meet the complex demands of inclusive classrooms. Existing research, including studies by Arı and Başer (2022) and Sindelar et al. (2010), has underscored the need for targeted curriculum development in instructional design tailored specifically for preservice special education teachers. While these studies have illuminated various challenges and opportunities within the field, there remains a pressing need to bridge the gap between theory and practice, ensuring that preservice teachers are equipped with the requisite knowledge and skills to support the diverse needs of their future students.

The difficulties faced by pre-service special education teachers can be traced back to the inadequate research focus on nurturing their instructional design abilities, notably the absence of tailored "instructional design curriculum". Consequently, this study delves into the creation of pertinent instructional design curriculum aimed at bolstering the instructional design abilities of pre-service special education teachers and enhancing their teaching effectiveness.

Research Objectives

To develop a curriculum for enhancing pre-service special education teachers' instructional design ability and evaluate the effectiveness of the curriculum.

Literature Review

Theoretical basis

The curriculum development of this study mainly follows three theories, namely Mastery Learning Theory, Social Constructivism Theory and The Taba Model.

1. Mastery Learning Theory

The curriculum design Bloom's (1968) mastery learning theory amalgamates deliberate practice and repetition with diverse instructional strategies, aimed at optimizing learners' potential. The principles of mastery learning underscore the belief that all students can achieve mastery given appropriate instruction. Key components include establishing clear learning goals, formative assessments coupled with corrective actions, and summative evaluations (Guskey, 2007). In this study, mastery learning theory provides a theoretical framework that can guide the curriculum development process for preservice special education teachers, informing the design of inclusive, differentiated, and effective instructional practices.

2. Social Constructivism Theory

Social constructivism, rooted in Vygotsky's (1978) framework, elucidates how cognitive development transpires within social contexts before internalization by individuals. According to Leeds-Hurwitz (2009), learning ensues through collaborative knowledge construction among individuals, emphasizing the significance of interaction with peers and experts. Social constructivism advocates for active learning, where learners engage in discovering principles and concepts through authentic tasks and interactions (Brown et al., 1989; Ackerman, 1996). In this study, the social constructivism theory offers valuable insights into the design of inclusive, collaborative, and active learning experiences for preservice special education teachers. By integrating these principles into the curriculum development process, educators can ensure that future teachers are equipped with the knowledge and skills needed to effectively support students with disabilities in their learning journey.

3. The Taba Model

Taba's (1962) curriculum development model delineates a systematic process encompassing needs diagnosis, goal formulation, curriculum selection, organization, and evaluation. Principles such as sequential ordering, integration of logical and psychological principles, curriculum focus definition, and diversity in learning experiences are integral to effective curriculum organization. In synthesis, by aligning with the instructional design model in special education and drawing from theoretical frameworks such as mastery learning theory, social constructivism, and the Taba model, special education teachers can enhance their instructional design abilities, fostering optimal learning outcomes for diverse learners. The Taba model offers researchers a systematic understanding for curriculum design, providing comprehensive support for developing curriculum to enhance the instructional design abilities of preservice special education teachers.

The Instructional Design Model in Special Education

Instructional design in special education often adheres to a process-oriented model (Xu & Qu, 2011), characterized by three principal phases: analysis, design, and evaluation. The analysis phase involves comprehensive examination, encompassing instructional content analysis and learner analysis. Subsequently, the design phase entails the formulation of instructional objectives, strategies, processes, and suitable media. Finally, the evaluation phase is dedicated to assessing the effectiveness of the instructional design. Moreover, it's crucial for special education teachers to understand that the psychological development of students with special needs differs from that of normal students (Zhang & Yan, 2021). However, instructional design models that are usually used in general educational Settings are still applied to special educational settings. Special education teachers must conscientiously tailor instructional materials for disabled children, considering factors such as simplifying instructional content, establishing general and multi-level instructional objectives, integrating assistive technology, and adapting evaluation methods accordingly (Kollmann & Hardré, 2013).

The Content of Special Education Teachers' Instructional Design Ability (IDA)

The content of Instructional Design Ability (IDA) for special education teachers encompasses three core facets within the instructional design process: analyzing text and learner characteristics, designing objectives, strategies, media, and processes, and evaluating learning outcomes (Zhang et al., 2004; Du, 2011; Liu, 2012). By considering both commonalities and distinctions between normal and disabled students, special education teachers can refine their IDA, incorporating individualized objective design within the design domain.

The Path of IDA Enhancement

The primary aim of professional education, as articulated by Everwijn et al. (1993), is to ensure the effective translation of acquired knowledge into practical skills. Therefore, professional education programs must prioritize the integration of theoretical knowledge with practical application. Within each instructional unit, as emphasized by Gallacher and Johnson (2019), teachers embark on a developmental journey characterized by three distinct stages: surface, deep, and transformational learning (Frey et al., 2018).

1. Surface Learning: Surface learning involves the initial acquisition of discrete units of knowledge. Teachers receive information and deepen their understanding through practical application. Furthermore, this process of applying knowledge leads to the acquisition of essential skills, thereby facilitating the translation of theoretical knowledge into practical competencies (Everwijn et al., 1993).

2. Deep Learning: Deep learning signifies a critical phase wherein teachers synthesize various learning materials into cohesive frameworks. Through collaborative interactions, educators identify connections between concepts, develop conceptual models, and refine their instructional strategies. This immersive approach not only fosters a comprehensive understanding of the subject matter but also cultivates the organizational skills necessary for effective instructional design (Gallacher & Johnson, 2019).

3. Transformational Learning: The pinnacle of the educational journey occurs during transformational learning. At this stage, teachers transcend conventional pedagogical boundaries by applying their knowledge and skills in novel contexts. This adaptive application of learning signifies a qualitative shift towards proficiency and expertise in instructional design. Through experiential learning opportunities, teachers seamlessly integrate theory with practice, thereby enhancing their instructional design ability (Everwijn et al., 1993).

Central to the enhancement of Instructional Design Ability (IDA) is the seamless integration of knowledge acquisition and application within professional education curricula. This integrated approach ensures that teachers continually progress through the stages of surface, deep, and transformational learning, thereby improving their instructional performance over time (Frey et al., 2018).

The path towards enhancing Instructional Design Ability (IDA) for preservice special education teachers involves a progression from knowledge acquisition to skill aggregation, culminating in the seamless integration of theory and practice. By embracing this developmental

journey and incorporating principles of surface, deep, and transformational learning, educators can effectively translate theoretical knowledge into practical instructional strategies, thereby maximizing student learning outcomes in special education settings.

In summary, while the content of IDA has been clearly defined, encompassing analysis of texts and learner characteristics, designing objectives, strategies, media, and processes, as well as evaluating learning outcomes, there is currently a lack of research on personalized course design specifically tailored for preservice special education teachers. This research gap necessitates exploration into how to integrate the core content of IDA with the actual needs of the special education field to develop personalized courses for preservice special education teachers, maximizing their instructional design abilities.

Drawing on previous research, we identified gaps in enhancing Instructional Design Ability (IDA) for preservice special education teachers.

1. Extant studies have clearly indicated significant differences in the psychological conditions of typical students and those with special needs during the learning process (Zhang & Yan, 2021). However, in previous instructional design and practices, preservice special education teachers lack the capacity to simplify instructional content, formulate tailored instructional objectives, integrate assistive technology, and adjust evaluation methods (Qian & Zou, 2009).

2. Although previous research has systematically summarized the core components of IDA, including teachers' abilities in text and learner analysis, objective design, strategy formulation, media selection, process development, and evaluation techniques (Du, 2011; Liu, 2012; Zhang, 2004), this remains merely theoretical guidance. Currently, there have been no attempts to develop courses specifically targeting this array of abilities to enhance IDA for preservice special education teachers.

3. In previous research, when it comes to curriculum development, researchers have individually or in pairs adopted theories such as master learning theory, social constructivism theory, and the Taba model for curriculum development. However, there is a lack of research systematically integrating them for curriculum development.

Based on these research gaps, this study aims to develop a curriculum for enhancing pre-service special education teachers' instructional design ability and evaluate the effectiveness of the curriculum.

Conceptual Framework

This study utilized a mixed methods approach, anchoring the research conceptual framework in the Mastery Learning Theory, Social Constructivism Theory, and Taba Model. These theoretical foundations guided the development of a curriculum developed to enhance the instructional design ability of preservice special education teachers. Figure 1 illustrates the specifics.

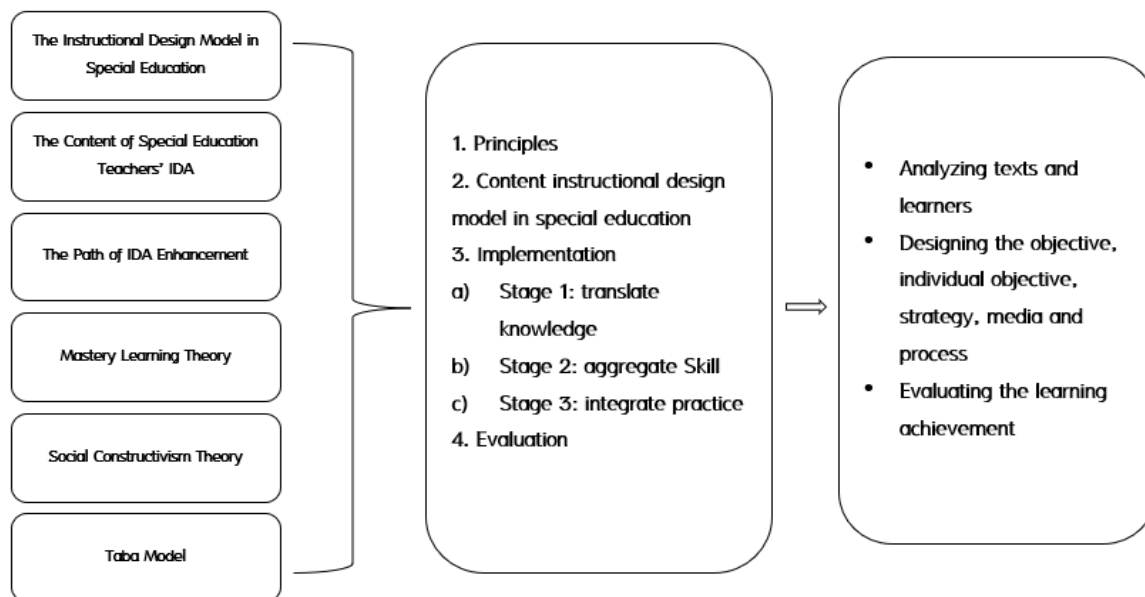


Fig.1 Conceptual Framework

Research Methodology

This study adopted a mixed methods approach, integrating both quantitative and qualitative methodologies. The methodology is delineated as follows:

Research Design

The development of the curriculum in this study was divided into four stages (see Fig.2) in accordance with established research and development methodologies. All instruments utilized in this study underwent rigorous testing to ensure their content validity, reliability, and appropriateness.

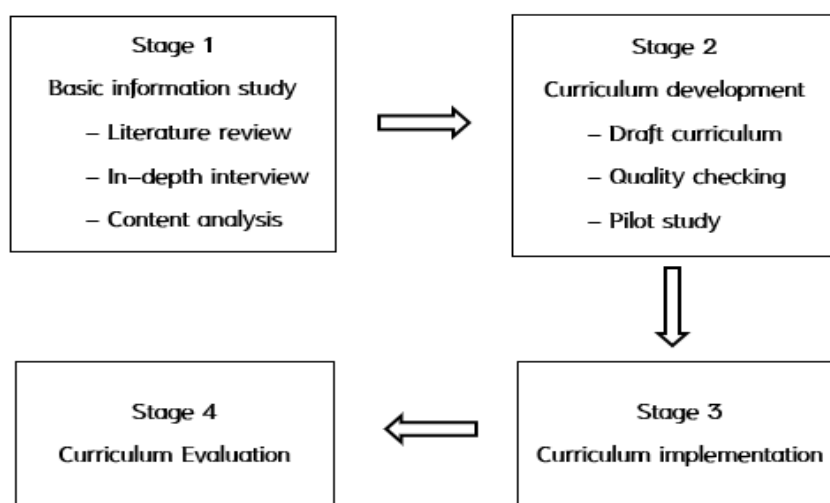


Fig.2 Research Design

Research Population

The population of the research was: a total of 644 junior preservice special education teachers from 16 universities in the southwest of China.

Research Sample

This study utilized a multi-stage random sampling approach. Initially, a cluster random sampling method was employed to randomly select one university from a pool of 16. Subsequently, a sample of 32 junior preservice special education teachers from Chongqing Normal University was randomly chosen for this study.

Data Collection

Before developing the curriculum, researchers collected information and data on theories and curriculum developing methods related to preservice special education teachers and their instructional design abilities. Additionally, researchers conducted in–depth interviews with teaching supervisors, expert special education teachers, and preservice special education teachers to gain insights into the challenges preservice special education teachers face, identify crucial knowledge and skills required for instructional design, gather recommendations for curriculum enhancement, and comprehend the expectations and requirements of preservice teachers to improve teaching practices and curriculum development in special education. Before and after implementing the curriculum, the researchers used IDA assessment scale and curriculum evaluation interview protocol to collect the data for evaluating the IDA of the participants.

Data Analysis

For the qualitative part, the researchers transcribed the key ideas verbatim from the in-depth interviews and performed an inductive thematic content analysis on the gathered interview data. After the implementation, the researcher evaluated the participants' learning outcomes and solicited their feedback and suggestions regarding the curriculum.

For quantitative part, the researchers utilized paired sample t-test to compare mean score of pretest and posttest to analyze the IDA of the participants.

Research Results

Results of stage 1

Results of Literature Analysis

Special education instructional design was tailored to the physical and mental characteristics of special children. It involved adapting teaching content, designing differentiated teaching strategies, processes, and assessments, and selecting and designing instructional media with the aid of assistive technologies. These considerations primarily encompassed teaching methods that aligned with the unique physical and mental attributes of special children, as well as curriculums that addressed their specific needs and challenges. As a teacher of special education, it was necessary to design systematic teaching plans considering the physical and mental characteristics, abilities, and needs of special children. Instructional design in special education emphasized the consideration of learner differences in accordance with general education instructional design. Instructional strategies, instructional media, instructional processes, and instructional evaluation required individualized design. Individualized instructional objectives served as the foundation of these designs. Therefore, the model of instructional design in special education should incorporate the design of individualized instructional objectives.

Results of in-depth interview

Findings from in-depth interviews with teaching supervisors revealed that newly hired teachers encountered challenges in interpreting textbooks and formulating objectives. One of the excerpts from the interview was shown below.

I believe their (preservice special education teachers) primary challenge is related to the textbook. It can be challenging for them to fully comprehend the texts. For instance, when presented with an article, they may face difficulties in identifying the main points. Similarly, when

using a math textbook, they may lack a strong understanding of the concepts. Consequently, it becomes challenging for them to align their teaching with the learning objectives (Supervisor D).

Moreover, the teachers are struggled with designing comprehensive teaching plans essential for developmental special education. To address these issues, it is recommended to incorporate a case study approach into the instructional design curriculum tailored for children with disabilities. This addition would not only enrich theoretical instruction but also bolster practical experience. Preservice special education teachers, as revealed in the interviews, lacked prior exposure to relevant instructional design curriculum. While lectures seemed manageable in class, challenges arose during practical applications. To address this gap, integrating both individual and group teaching methods is recommended. These findings come from an interview with supervisors shown below.

I personally believe that a combination of theory and practical application should be adopted in modular teaching. It is recommended to allocate 30% of the curriculum for theoretical teaching, 20% for practical teaching, and the remaining 50% to clarify the logical relationship between different modules. In practical sessions, the teacher can divide the students into small groups, allowing each group to choose independently a topic and design their teaching based on a provided case scenario (Supervisor A and Supervisor C).

Conversely, insights from expert special education teachers highlighted their adherence to the instructional design process model, structuring teaching modules and flow accordingly. They emphasized the importance of aligning theoretical instruction with the framework of the instructional design model. The details were shown below.

It is advised to conduct the teaching of theory and practice in accordance with the instructional design process in a sequential manner to enable learners to have a clear understanding of the complete framework of instructional design (Expert teacher B).

Results of content Analysis

Currently, the policy documents provided a detailed description of the IDA of special education teachers. Currently, national policy documents required special education teachers to possess IDA, including the ability to analyze instructional content and learners with special needs, design instructional objectives, strategies, media, and evaluation, then form teaching plans based on the analysis results.

Result of stage 2

Result of the draft curriculum

The curriculum provided a balanced blend of theory and practice. Tailored to offer a comprehensive grasp of instructional design concepts, it also emphasized hands-on application through the design of lesson plans. Through active participation in the instructional design process, learners were encouraged to understand the interconnectedness of its components, fostering the development of logical thinking skills. The curriculum comprised three stages, each spanning a total of 48 sessions, with each session lasting 45 minutes. The draft curriculum was shown as follows:

Table 1 Curriculum Model

Module	Unit	Time	Topic	Teaching Method
Stage 1: Knowledge translation	Overview	2	Overview of Instructional design in special education	Lecture & discussion
	Analysis	6	Instructional content analysis	Lecture; demonstration; case study; discussion
		2	Analysis of learners with special needs	
	Design	4	Instructional objective design	
		4	Individual instructional objective design for learner with special needs	
		4	Instructional strategy design for learner with special needs	
		2	Instructional media design for learner with special needs	
		4	Instructional process design for learner with special needs	
	Evaluation	4	Instructional evaluation design for learner with special needs	Lecture; demonstration; case study; discussion
Stage 2: Skill aggregation		12	Comprehensive practice across all topics	Group learning; discussion; lecture
Stage 3: Practice integration		4	Integrated practice across all topics	Group learning; discussion

Results of Checking the Quality of Draft curriculum

The consistency assessment revealed high scores ranging from 0.80 to 1 for each item, indicating a strong consistency throughout the draft curriculum. Similarly, the appropriateness

assessment yielded high scores ranging from 4.00 to 5.00, affirming the alignment of each item with the curriculum's elements.

In response to feedback from experts, the researcher refined the draft curriculum, focusing on key areas such as clarifying curriculum principles, specifying objectives, and enhancing evaluation diversity.

Results of pilot study

Following the pilot study, it was recommended to include demonstrations alongside explanations in instructional activities. Furthermore, to enhance the retention of theoretical knowledge from the first stage, it was suggested to initiate discussions after completing teaching in each module during the knowledge translation stage.

Result of stage 3

The learning achievement in three stages

The researcher conducted an analysis of mean scores across three stages, with the results presented as follows:

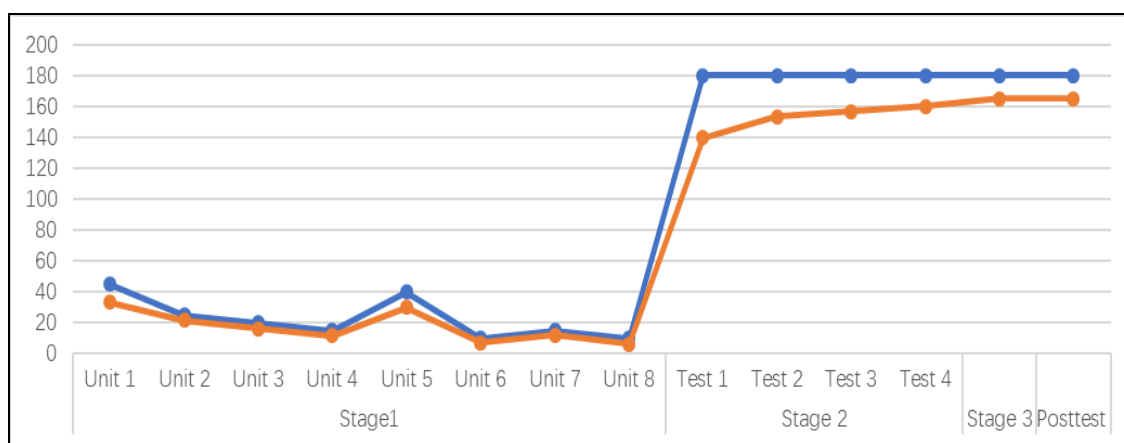


Fig.3 The trend of IDA

Based on the quantitative analysis presented in the figure, a clear trend emerged: there was a consistent and progressive increase in the sample mean from Stage 1 to Stage 3 (as shown in Fig.3). This pattern not only highlights the statistical significance but also emphasizes the substantial impact of the curriculum intervention. Specifically, it indicates a significant improvement in instructional design abilities (IDA) among preservice special education teachers over the study period.

The researcher analyzed data from both pretest and posttest assessments, revealing significant differences between the sample means pretest and posttest of the curriculum (64.50 and 165.34 respectively). The sample mean following curriculum implementation surpassed the pretest mean. The correlation coefficient between the pretest and posttest samples was 0.346, indicating a notable improvement in learners' IDA following curriculum implementation.

Furthermore, the researcher conducted an analysis of the p-value between the pretest and posttest, revealing a noteworthy improvement of 100.844 in the average IDA score of learners after the curriculum intervention ($SD = 10.890$, $df = 31$, $p\text{-value} = .000$). The rejection of the null hypothesis (H_0) confirms the curriculum's efficacy in significantly enhancing the average IDA proficiency of preservice special education teachers.

Results of Effectiveness Evaluation and Curriculum Improvement

Results of Effectiveness Evaluation

According to the data analysis from above, it could be concluded that, after the curriculum implementation, the IDA of preservice special education teachers was higher than before, including before, during, and after implementing the curriculum.

Results of Curriculum Improvement

Based on the findings from the curriculum implementation, the researcher made revisions to the draft curriculum, including:

1. Replacing the cases addressed in the knowledge translation stage with scenarios distinct from the exercise scenarios.
2. Providing comprehensive guidelines for group collaboration during the stages of knowledge translation and integration, along with in-depth explanations.
3. Intensifying oversight by the instructor throughout each group's collaboration process to ensure effective cooperation.

Discussions

The curriculum developed in this study is firmly rooted in the objective model of curriculum development and design philosophy as proposed by Tyler (1949). Tyler's model served as the foundation, while Taba (1962) further refined it by expanding the original four steps into seven. Given the close alignment of the curriculum with these principles, the use of the objective model for curriculum development in this study is deemed appropriate.

This research meticulously considered the fundamental sources of curriculum objectives, including learners themselves, social life, and teaching experts, as highlighted by Taba (1962). Curriculum objectives were established through a comprehensive analysis of these aspects, rendering the determination both rational and scientific. Chen (2013) based curriculum objectives on the content of instructional design abilities, while Tang (2022) grounded them in national policy documents, existing literature, learning time, and resources. Similarly, their curriculum contents cover the scope of instructional design abilities, mirroring the approach adopted in this study.

The effective organization of content is paramount for facilitating meaningful learning experiences (Taba, 1945). Therefore, instructional design curriculums should adopt a progressive structure, gradually exploring deeper into the content through successive steps (Ma & Sheng, 2016). In this study, the curriculum content and learning activities are segmented into three stages: knowledge transformation, skill aggregation, and practice integration. Each stage integrates principles from mastery learning theory and social constructivism theory, emphasizing the pathway of ability formation. This sequential approach ensures a gradual increase in complexity, enabling learners to build upon their previous knowledge and understanding. Overall, the organization of curriculum content and learning experiences in this study aligns with Taba's curriculum development model (1962) and is consistent with the approaches of Chen (2013) and Tang (2022), emphasizing the relationship between overall curriculum content and local instructional design processes within the instructional design framework.

Taba (1962) stresses the importance of employing various evaluation methods to accurately measure learners' progress. In this curriculum, a performance assessment approach is utilized to gauge learners' academic achievements accurately. This evaluation method encompasses diagnostic, formative, and summative assessments, aligning with both Taba's theory and the principles of mastery learning theory. Similarly, Chen (2013) and Tang (2022) incorporated formative and summative evaluations in curriculum evaluation.

Knowledge from Research

This study bases on master learning theory, social constructivism theory and Taba model, integrating the realities of both teachers and learners, to develop a curriculum aimed at enhancing the Instructional Design Abilities (IDA) of preservice special education teachers. The knowledge from this research is shown in Fig.4.

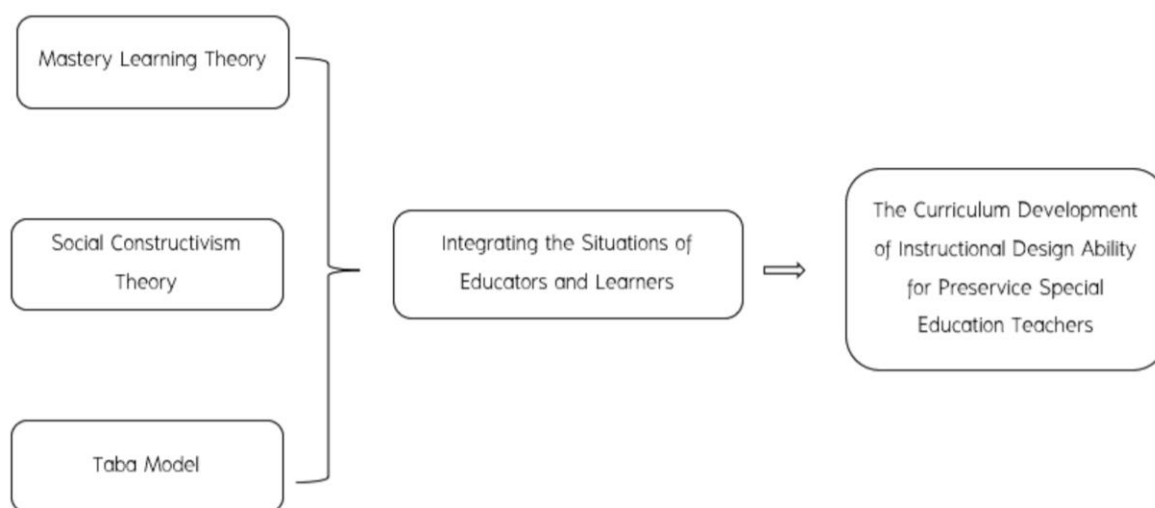


Fig.4 Knowledge from Research

Conclusion

This research, rooted in the systematic process model of special education instructional design, scrutinized the fundamental content and developmental trajectory of instructional design competencies among special education teachers. Concurrently, drawing upon the principles of mastery learning theory and social constructivism, the researchers employed Taba's curriculum development model to craft a curriculum tailored to bolstering the instructional design proficiencies of pre-service special education teachers.

The research's findings illuminate a noteworthy enhancement in the instructional design aptitude of pre-service special education teachers subsequent to their systematic engagement with this curriculum.

Suggestions

In order to maximize the training efficiency of this curriculum, trainers should adhere to the following principles:

Follow the principles of knowledge acquisition in teaching. Trainers should teach step by step from simple to difficult or complex in instructional activities, continuously provide feedback to learners during teaching, enhance their learning ability, stimulate questions, and promote continuous learning.

Use various assessment methods to understand learners' progress, such as observation, oral assessment, practice, and homework records. Trainers must observe learners' learning situations, check their understanding, correct misunderstandings, and continue to teach difficult or complex materials.

Trainers should develop a variety of learning materials to enable learners to supplement their reading at each stage and broaden their knowledge perspective.

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