DEVELOPMENT OF A CURRICULUM FOR ENHANCING INSTRUCTIONAL DESIGN ABILITY OF PRESERVICE SPECIAL EDUCATION TEACHERS

XIAOQIN YAN

Graduate School Srinakharinwirot University

2023

การพัฒนาหลักสูตรเพื่อเสริมสร้างความสามารถในการออกแบบการเรียนการสอนของนักศึกษาครู การศึกษาพิเศษ

XIAOQIN YAN

ปริญญานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตร
ปรัชญาดุษฎีบัณฑิต สาขาวิชาการวิจัยและพัฒนาหลักสูตร
บัณฑิตวิทยาลัย มหาวิทยาลัยศรีนครินทรวิโรฒ
ปีการศึกษา 2566

DEVELOPMENT OF A CURRICULUM FOR ENHANCING INSTRUCTIONAL DESIGN ABILITY OF PRESERVICE SPECIAL EDUCATION TEACHERS

XIAOQIN YAN

A Dissertation Submitted in Partial Fulfillment of the Requirements

for the Degree of DOCTOR OF PHILOSOPHY

(Curriculum Research and Development)

Graduate School, Srinakharinwirot University

2023

THE DISSERTATION TITLED

DEVELOPMENT OF A CURRICULUM FOR ENHANCING INSTRUCTIONAL DESIGN ABILITY OF PRESERVICE SPECIAL EDUCATION TEACHERS

BY

XIAOQIN YAN

HAS BEEN APPROVED BY THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY
IN CURRICULUM RESEARCH AND DEVELOPMENT AT SRINAKHARINWIROT UNIVERSITY

(Assoc. Prof. Dr. Chatchai Ekpanyaskul, MD.)
Dean of Graduate School

ORAL DEFENSE COMMITTEE

..... Major-advisor
(Asst. Prof. Dr.Khanittha Saleemad)

..... Co-advisor
(Assoc. Prof. Dr.Daranee Saksiriphol)

..... Chair
(Asst. Prof. Dr.Ampapon Tantinakhongul)

..... Committee
(Assoc. Prof. Dr.Marut Patphol)

..... Committee
(Asst. Prof. Dr.Jitra Dudsdeemaytha)

Title	DEVELOPMENT OF A CURRICULUM FOR ENHANCING INSTRUCTIONAL DESIGN ABILITY OF PRESERVICE SPECIAL EDUCATION TEACHERS
Author	XIAOQIN YAN
Degree	DOCTOR OF PHILOSOPHY
Academic Year	2023
Thesis Advisor	Assistant Professor Dr. Khanittha Saleemad
Co Advisor	Associate Professor Dr. Daranee Saksiriphol

Instructional design ability has always been a key objective in the education of pre-service teachers. Theoretical knowledge of instructional design is the cornerstone for the growth of instructional design ability in pre-service special education teachers. However, pre-service teachers do not fully grasp this theoretical knowledge, resulting in numerous problems in course teaching. This research aims to develop a curriculum for enhancing the instructional design ability of pre-service special education teachers and to evaluate its effectiveness. This research was divided into four stages: First, through literature analysis, in-depth interviews with teaching supervisors, expert special education teachers, and learners, and content analysis of official files, the basic information for curriculum design was determined. Second, a draft curriculum was developed, its quality was checked, and a pilot study was conducted. Third, 32 junior preservice special education teachers from Chongqing Normal University were randomly selected as a sample, and the curriculum was implemented. Lastly, curriculum evaluation and improvements were carried out. The research results were as follows: (1) the curriculum was comprised of 48 class periods, divided into eight units and three learning stages; (2) all pre-service special education teachers demonstrated significant improvement, notably higher compared to before and a significance level of .05. Pre-service special education teachers expressed high satisfaction with the curriculum.

Keyword : Curriculum of instructional design, Special education, Instructional design ability, Pre-service special education teachers

ACKNOWLEDGEMENTS

For someone in midlife like me, pursuing a PhD has been a long and challenging journey. I am grateful for this exciting path that has enabled me to learn at a high level and face unforeseen challenges with courage. I also deeply appreciate the teachers, family, friends, colleagues, and students who have accompanied me along the way.

First and foremost, I would like to thank my teachers. Dr. Khanittha, you have always provided timely guidance whenever I encountered confusion. Dr. Daranee, thank you for meticulously reviewing my thesis and offering valuable suggestions, often with unexpected humor that eased my tension during difficult times. Beyond thesis guidance, both of you took us to visit special education schools and institutions, broadening our horizons by exposing us to special education in Thailand. During our studies, Dr. Marut patiently explained the process of course development; Dr. Jitra's classes always started with a surprise and were filled with passionate explanations; Dr. Waiyawut's classes were rational and rich in content. In your classes, we experienced different teaching styles and benefited greatly. I am also deeply grateful for your guidance on my thesis.

Secondly, I want to thank my family. My husband always helped me solve the difficulties I encountered in my studies. My parents took care of household chores and looked after my children, allowing me to focus on my studies. My children, they often surprised me with little gestures that warmed my heart.

Thirdly, I am grateful to my friends and colleagues. Whenever I faced difficulties in my studies, my friends and colleagues were always there to help and encourage me, making my research process smoother.

Lastly, I want to thank my students. They supported my research, and although I guided them in their courses, my research would not have been completed smoothly without them. Throughout the journey, we discussed, supported each other, and formed beautiful memories that I will cherish forever.

XIAOQIN YAN

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1
INTRODUCTION

Background

"Every child should receive fair and high-quality education" (Chinese Central People's Government, 2017; Chinese Central People's Government, 2022). Ensuring high-quality classroom instruction is crucial for achieving this goal (Gu, 2017). In special education, adhering to correct operational procedures and fundamental norms in instructional design is key to maintaining classroom teaching quality (Sheng, 2008; Evans, 2021). The level of instructional design ability is a critical factor influencing and limiting classroom teaching quality (Guan & Huang, 2021; Jia, 2008; Qin, 2001; Yao, 2013; Zhang & Chen, 2006).

Special education primarily serves children with visual impairments, hearing impairments, and developmental disabilities. Among these, children with developmental disabilities constitute the majority (Yu, 2012; Zheng, 2017). The diverse types and degrees of disabilities among children with developmental disabilities present greater challenges in teaching, thereby raising the demands on teachers' instructional design abilities (Forsling, 2019; Gao et al., 2021; Thorius, 2016; Wang & Wang, 2022).

Instructional design ability is one of the essential abilities that teachers must possess (Guan & Huang, 2021; Liu, 2013). It refers to the ability to plan specific instructional content, objectives, strategies, and assessments under theoretical guidance. instructional design ability forms the foundation of educational and teaching abilities and is central to a teacher's teaching competency (Du, 2011). The development of teachers' instructional design ability is a gradual, iterative process (Wang, 2004) that includes three significant progressive stages (Yu, 2010). Cultivating this ability requires both pre-service education and in-service training (Ma & Sheng, 2016). In pre-service education, the primary focus is on developing the first significant stage of this ability. The Ministry of Education of China included instructional design ability as a professional requirement in the professional standards, issued in 2012 and 2015, for kindergarten, primary, secondary, and special education teachers, reflecting the future needs for

teaching staff (Liu, 2018). instructional design ability impacts the future career development of pre-service teachers (Liu, 2018). Thus, it has always been a key objective in pre-service teacher education (Liao, 2022) and is one of the essential abilities tested in teacher certification exams (Song et al., 2014).

Theoretical knowledge of instructional design serves as the cornerstone for the development of teachers' instructional design ability, and it is crucial for preservice teachers to master this knowledge (Zheng, 2007). To achieve this goal, targeted curriculum design is necessary (Jia, 2008). In these specially designed curriculums, the core objective is for preservice teachers to acquire theoretical knowledge of instructional design. The curriculum content should cover the essential elements of instructional design, be organized progressively, and include ample practice within learning activities (Ma & Sheng, 2016). Through such curriculum design, preservice teachers can grasp the fundamental theoretical knowledge of instructional design and apply it in practical settings (Luo, 2012; Ma & Sheng, 2016). In these curriculums, learning activities such as "principles combined with cases," "lectures combined with discussions," and "projects combined with guidance" should be employed as much as possible (Ma & Sheng, 2016). These activities help learners think about practice while learning theoretical knowledge and understand theoretical knowledge in practice (Cohn et al., 1987), thereby promoting the development of instructional design ability (Luo, 2012).

However, the current instructional design curriculums of teacher education focus primarily on the content of specific disciplines, basic teaching principles, and important theories (Sun, 2014), fundamental principles, teaching strategies, and techniques (Liu & Liao, 2018). The learning activities in these curriculums are mainly teacher-to-student knowledge transmission activities, most of which are lecture-based. Instructors overemphasize the explanation of theories while explaining theoretical knowledge, leading to information overload in the classroom, a lack of interaction and practical guidance, and a weak connection to teaching practice (Wang & Fang, 2004; Liu, 2018; Juhler, 2016; Han, 2020; Lv et al., 2021). This results in pre-service teachers

having an insufficient understanding of the theoretical knowledge involved in instructional design (Yu, 2013; Song et al., 2014; Lu & Zhong, 2013; Zhang, 2022), making it difficult for them to grasp related knowledge points (Lu & Zhong, 2013), and hence, challenging to use theoretical knowledge to guide practice (Valli, 1992).

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, preservice special education teachers face challenges in integrating professional knowledge into instructional design when dealing with various types of disabled children (Brown & Green, 2021; Guo, 2016; Gao et al., 2021). They find it difficult to tailor teaching to exceptional children (Gao et al., 2021) and encounter varying degrees of problems in different dimensions of instructional design (Hardré & Kollmann, 2013; Wang, 2018). Additionally, they lack awareness of applying learned instructional design theories in practice (Darling-Hammond, 2006; Liu et al., 2012).

Researches by Arı and Ba**Ş**er (2022) and Sindelar et al. (2010) have emphasized the necessity of tailored instructional design curriculum for preservice special education teachers. Although these studies have emphasized several challenges and opportunities within the field, there is still a pressing need to close the gap between theory and practice. It is essential to ensure that preservice teachers possess the necessary knowledge and skills to meet the diverse needs of their future students. The difficulties faced by preservice special education teachers can be traced back to inadequate research focus on nurturing their instructional design abilities, notably the absence of tailored "instructional design curriculum." Therefore, in the pre-service phase, targeted curriculums focusing on instructional design for children with developmental disabilities should be established to train special education teachers.

Research Questions

1. What does the curriculum designed to enhance the instructional design ability of preservice special education teachers look like?

2. How does the curriculum aimed at enhancing the instructional design ability of preservice special education teachers work?

Research Objectives

1. To develop a curriculum for enhancing preservice special education teachers' Instructional design ability.

2. To evaluate the effectiveness of the curriculum for enhancing preservice special education teachers' Instructional design ability.

Conceptual Framework

This research was conducted in initial teacher education to enhance the instructional design ability of preservice special education teachers at the first explicit stage. The theoretical framework was shown in figure 1:

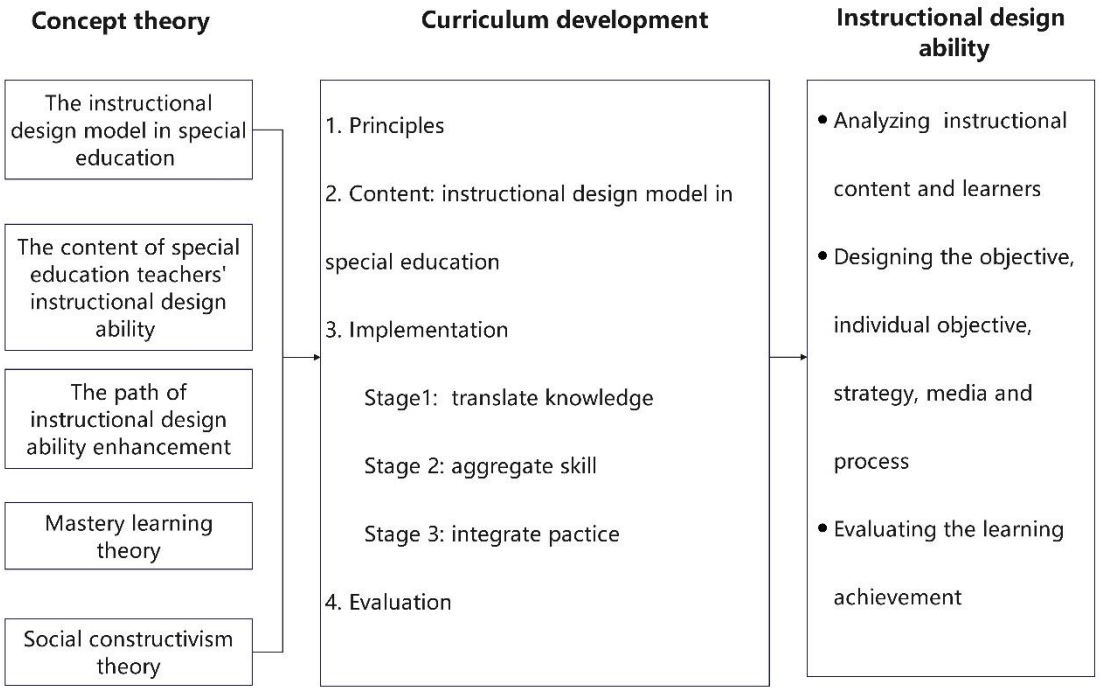


Figure 1 Conceptual framework

In this research, based on the instructional design model in special education, the content of special education teachers' instructional design ability, the path of instructional design ability enhancement, mastery learning theory and social constructivism theory, the curriculum was developed: the principles, content, implementation (through three stages), and evaluation, then the ability was evaluated by an assessment scale which was consisted of three components: analysis, design and evaluation.

Definition of Terms

Instructional Design Ability (IDA)

Instructional design ability refers to the ability of analyzing the instructional content and learners with special needs, designing the objective, individual objective, strategy, media and process for learners with special needs, and evaluating their learning achievement.

Section 1: analyzing the instructional content and learners

This section involves two parts: analyzing instructional content and analyzing learners with special needs. The analysis of instructional content includes background, functions, structure, elements, learning types, and tasks. The analysis of learners with special needs covers general characteristics, types, and degrees of disabilities in children with disabilities, sensory perception status, as well as characteristics of cognitive development, starting level, learning style, motivation, attitude, and attention.

Section 2: designing the objective, individual objective, strategy, media and process for learners with special needs

It consists of five parts. Designing the objective entails defining the precise and explicit outcomes expected to be achieved through the learning of specific knowledge. Individual instructional objective design for learners with special needs involves specifying concrete outcomes that learners with different starting levels are expected to achieve after learning specific knowledge. Instructional strategy design for learners with special needs refers to the comprehensive arrangement and plan of the

entire teaching process, including the sequence of teaching activities, methods, materials, order of instruction, and forms of instructional organization. Instructional media design for learners with special needs includes selecting teaching media and assistive technology, and planning the timing, methods, steps, and frequency of presentation. Instructional process design for learners with special needs involves using teaching content as a medium through which teachers and students engage in individual activities aimed at exploring knowledge.

Section 3: instructional evaluation for leaners with special needs

Instructional evaluation for leaners with special needs involves the individual evaluation criteria and methods for learners with special needs.

Preservice special education teachers

Preservice special education teachers are student teachers from southwest China who participate in a special education teacher preparation program, aiming to obtain certification in special education.

The curriculum of Instructional Design in Special Education

A curriculum is a systematically designed educational framework that offers instructional and learning experiences focused on a particular subject or topic. It encompasses objectives, content, implementation, and evaluation.

The curriculum for instructional design in special education is developed based on the instructional design model in special education, the content of instructional design abilities of special education teachers, the path of instructional design ability enhancement, mastery learning theory, and social constructivism theory, all aimed at enhancing the instructional design ability of preservice special education teachers. This curriculum consists of two modules: an overview of instructional design for special education and how to do instructional design in special education. The second module includes eight units: instructional content analysis, analysis of learners with special needs, instructional objective design, individual instructional objective design for learners with special needs, instructional strategy design for learners with special needs, instructional media design for learners with special needs, instructional process

design for learners with special needs, and instructional evaluation design for learners with special needs.

In curriculum implementation, there are three stages: knowledge translation, skill aggregation, and practice integration, totaling 48 class periods. During these three stages, the learning process follows the sequence: instruction—assessment—feedback. Performance assessment is employed in this curriculum to evaluate learners' achievements using an instrument called the instructional design ability assessment scale.

Scope of the Study Research

Population

A total of 644 junior preservice special education teachers who were enrolled in 16 universities in southwest China.

Sample

This research employed a multi-stage sampling method. In the first stage, Chongqing City was selected using simple random sampling from universities in the southwestern region of China that train preservice special education teachers. In the second stage, Chongqing Normal University was selected using simple random sampling from two universities in Chongqing City that train preservice special education teachers. In the third stage, junior preservice special education teachers were selected as the research sample using simple random sampling from four classes within the Special Education Department of Chongqing Normal University.

In China, universities that train preservice special education teachers typically enroll one class per year, and instruction is conducted on a class basis. Among the sampled 32 junior preservice special education teachers, all participants were over 18 years old. Therefore, the sample size for this study was determined to be 32.

Variables

Dependent Variable

The Instructional Design curriculum in Special Education.

Dependent Variable

Instructional design ability of preservice special education teachers.

CHAPTER 2
LITERATURE REVIEW

This chapter aims to review the relevant literature for this research, structured into six main sections. The first section addresses the concept of instructional design and the instructional design model in both general and special education. The second section covers definitions, content, and evaluation of instructional design ability. The third section discusses the enhancement of instructional design ability. The fourth section focuses on mastery learning theory, including its principles, the teaching-learning process, and evaluation methods. The fifth section introduces social constructivism theory, explaining its concept, the learning processes, and evaluation within its framework. The sixth section reviews related research on curriculum development, including definitions of curriculum and curriculum development, concepts of curriculum development, and studies on enhancing the instructional design ability of preservice teachers.

1. Instructional Design, Instructional Design model in General Education and Special Education

1.1 The concept of instructional design

Instructional design originated in the United States in the 1960s (Xu & Qu, 2011). The concept of instructional design has been elaborated by many researchers.

Gagne et al. (2005) contend that instructional design involves the systematic planning of an instructional system. Similarly, Richey (1986) describes instructional design as a systematic process that encompasses the planning, development, evaluation, and maintenance of learning environments across different subjects and scopes. Wu (1994) suggests that instructional design is the application of a systems approach to the study and exploration of the relationships between the elements of an instructional system and the coordination of their configuration through a set of specific operational procedures that allow the elements to be organically integrated to fulfil the functions of the instructional system. Gu (1999) states that

instructional design is a systematic approach to the study of instructional systems, instructional processes and the development of instructional plans. Li&Yan (2001) suggest that instructional design is a systematic approach to achieving He et al (2002) suggest that instructional design is mainly a systematic approach and related theories to plan instructional objectives, instructional contents, instructional methods, instructional strategies, instructional evaluation and other aspects to create a systematic process or procedure of instructional and learning. Xu&Qu (2011) point out that instructional design is a process of systematic analysis and planning of the elements involved in the instructional process. Fang & Sheng (2015) believe that instructional design refers to teachers' design of instructional, i.e. the process of teachers designing classroom instructional through the use of systematic methods.

Although researchers do not agree on the definition of instructional design, in terms of content, these concepts distinguish between broad and narrow definitions of instructional design. The broad definition describes the whole picture of instructional design from a macro perspective, while the narrow definition is teacher preparation. These definitions can be divided into two categories (Qiao, 2019), one from the ultimate purpose and intrinsic characteristics of instructional design, and the other from the 'process of instructional design', which considers instructional design as a series of processes of systematic analysis and planning of instructional and learning. In instructional design, a systematic approach to problem analysis and problem solving requires a comprehensive consideration of all relevant factors in each step of the process (Gu, 2013). The fundamental feature of instructional design is "how to create an effective instructional system".

1.2 Instructional design model

The basic structure of the instructional design process established through long-term instructional design practice activities is called the instructional design model (Xu & Qu, 2011). In the process of the development of the instructional design model, behaviorist theory argues that the main task of instructional design is to analyze and decompose learning content and transform it into behavioral goals, then select

instructional media and instructional methods and design instructional sequences; while aesthetics advocates that teachers should impart knowledge and skills in an integrated way, select interactive instructional strategies and instructional sequences, and armistices instructional activities; after continuous practice researchers have found that learners should also be given the initiative to become problem-solving inquirers. Instructional design should guide learners to construct their own structures and systems for acquiring knowledge and enhance their adaptability.

Functionally, there are two types of instructional design models: the conceptual model and the process model. The conceptual model identifies the various variables and their relationships in the instructional design process, while the process model's main function is to identify the steps of instructional design, focus on the practice of instructional design, and facilitate teachers' use (Xu & Qu, 2011). Therefore, the instructional design model explored in this research is primarily an instructional design process model. Such models are influenced by systems theory, communication theory, learning and instructional theory, and the experience of the constructors differs, as do the characteristics of each type of model. Xu&Qu (2011) combine the research results of instructional design theory and instructional design practice experience with the actual situation of primary and secondary schools, and divide the instructional design process model into three stages and eight elements. But in primary and secondary school, there are uniform national curriculum standards as well as teaching materials, and teachers' task is to teach around the national required curriculum standards and teaching materials. The learning focus of pre-service teachers in instructional design is to design instructional programs and implement them according to the national curriculum standards and teaching materials. Therefore, in this research, the analysis section is changed to instructional content analysis and learner analysis. There are three components in instructional design process model: analysis, design, and evaluation, just as shown in figure 2:

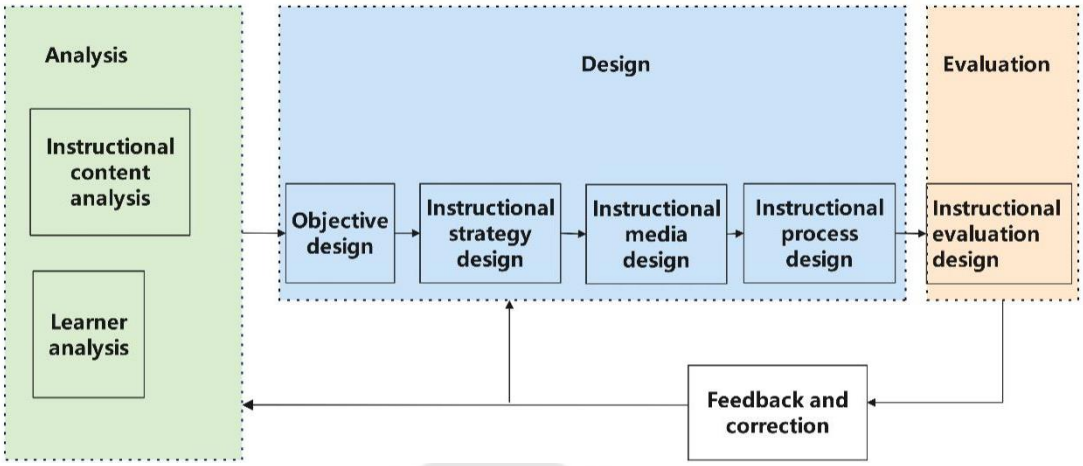


Figure 2 Instructional design model

adapted from Xu & Qu (2011), Instructional design: Principle and Technology. Beijing: Educational Science Press

The instructional design process model divides the process of instructional design into three content modules: analysis, design, and evaluation. The specific content of each module was presented in the table below.

TABLE 1 The specific content in instructional design process model

Module	Element	Content
Analysis	Instructional content analysis	Analysis of background, functions, structure, elements, learning types, and tasks (He, 2014).
	Learner analysis	Analysis of general characteristics, characteristics of cognitive development, starting level, learning style, and learning motivation (He, 2014).
Design	Instructional objective design	The precise and explicit outcomes expected to be achieved after designing the learning of a specific knowledge (He, 2014).
	Instructional media design	Selection of teaching media, and design of the timing, methods, steps, and frequency of presentation (Li, 2010).
	Instructional process	Using teaching content as a medium, teachers and students engaged in activities to explore truth (Xu & Qu, 2011).
Evaluation	Instructional evaluation design	The criteria and methods for evaluation (Wu,1994; Xie,2004; Chen,2009; Li,2010; Ma & Zhang, 2012; He,2014;).

In the component of analysis, instructional content analysis and learner analysis are included in it. Instructional content analysis involves contextual analysis, the functional analysis, structural analysis, elemental analysis, learning types and tasks analysis (He,2014). Learner analysis includes general characteristics analysis, cognitive

ability characteristics analysis, starting level analysis, learning style analysis, and learning motivation analysis (He, 2014; Xu & Qu, 2011).

The design component includes the design of instructional objectives, strategies, processes, and media. In June 2001, the Ministry of Education issued the Outline of Curriculum Reform for Basic Education (for Trial Implementation), stating that national curriculum standards must "reflect the state's fundamental requirements for students at various stages in knowledge and skills, processes and methods, as well as emotional attitudes and values." Consequently, instructional objectives should cover three domains: knowledge and skills, processes and methods, and emotional attitudes and values. Instructional strategy refers to the plan for achieving these objectives, encompassing various methods, materials, sequences, and organizational forms (Xu & Qu, 2011). Instructional process design involves planning the structural and procedural elements of the instructional and learning process, breaking it down into simpler segments and clearly illustrating the relationships between these elements (Xu & Qu, 2011). Instructional media design includes selecting instructional media, clarifying the role of instructional media in instruction, and designing the time of instructional media use in instructional and learning (Xu & Qu, 2011).

In the final part, evaluation design, it refers to learning achievement evaluation, which includes the rubric and evaluation method design (Xu & Qu, 2011; Li, 2016).

1.3 Instructional design model in special education

The psychological development of children with exceptional and ordinary children have both commonalities and differences (Zhang & Yan, 2021). Chen (2007) states that, the commonalities between exceptional children and ordinary children are mainly reflected in five aspects: the development process is similar, progressing from simple to complex, and influenced by genetics, environment, and education; similar physiological organizational structure; similar psychological needs; similar development of personality structure; and similar content of social adaptation. Therefore, the instructional design models used in general education could be used in special

education. However, due to their physiological structure and psychological characteristics, there is a significantly higher level of inter- and intraindividual differences among exceptional children as compared to ordinary children, and their learning ability and life adaptation are obviously weaker than those of ordinary children (Zhang, 2005). They also have problems with emotional management, language expression, behavioral control and interpersonal skills (Wu & Chen, 2005; Liu, 2008; Yan et al, 2009).

Given the similarities and differences in the development of regular children and children with special needs (Zhang & Yan, 2021), instructional design in special education should incorporate elements of general education while also necessitating specific adaptations tailored to the unique physical and mental characteristics of children with special needs. Teaching methods for addressing cognitive impairments in special education includes task analysis, direct instruction, memory training, cooperative learning, and interactive teaching, among others (Hou, 2015). Currently, the educational and therapeutic approaches for children with autism mainly include behavior management techniques, positive behavior support, communication and language instruction, communication training for nonverbal autistic children, social skills intervention, integrated learning, sensory-motor intervention, and adaptive skills training, among other strategies (Yang, 2005; Edward et al., 2021). The curriculum is tailored to address the requirements of visually impaired students, incorporating orientation and mobility training, braille and tactile reading materials, and the utilization of optical aids. Similarly, for students with hearing impairments, the curriculum includes auditory training, speech reading training, and speech training.

The systematical instructional design in Special education teaching systems have been carefully accommodate the abilities and needs of children with special needs (Qian&Zou,2009):

Curriculum modification: reducing the number of tasks, decreasing the scale of tasks, altering the evaluation methods, diversifying teaching strategies, and integrating all curriculums based on the teaching content.

Differentiated instruction: differences in content, process and assessment.

Assistive technology: assistive technology for sensory impairments, physical disabilities, and intellectual disabilities.

Universal design: general universality design for all people and all students.

According to Sui (2019), the instructional design ability of preservice special education teachers refers to their ability in applying curriculum adaptation principles and universal design for learning to set instructional goals, analyze instructional issues, develop and modify solutions, and optimize instructional effectiveness through a systematic approach tailored to the learning needs of special needs students.

This definition refers to the ability of preservice special education teachers: designing and adapting instructional content, instructional objective, instructional strategies, and instructional resources. It is consistent with the instructional design ability which is required for general education, but lays more focuses on meeting the needs of exceptional children.

As can be seen from the above, despite the need to meet the learning needs of children with special needs, these elements which are considered in special education instructional design remained the same in scope as the process model of general education instructional design, but special consideration should be given to the design of individualized instructional objective, the use of assistive technology and accessible environments. Therefore, it is necessary to add the design of individual instructional objective to the instructional design model in special education.

Therefore, in this research, the instructional design model for special education is structured as follows: analysis (of instructional content and learners), design (including objectives and individual objectives, strategy, media, and process), and the design of learning achievement evaluation. This model serves as the foundation of the knowledge system in this research and forms the curriculum content.

2.The definitions, Content and Evaluation of Instructional Design Ability

2.1 The definitions of instructional design ability

There are three schools of thought that defined instructional design ability (Liao, 2022): the "process" school, the "problem-solving" school, and the "ability" school. In the "process" school, Zhang, Jin, Chen, Du, Liu, etc., define instructional design ability as the ability to design each domain of instruction. According to the "problem-solving" school established by Qin, Liu, Liu, Pang, Qiao, etc., instructional design ability is the ability to solve specific teaching problems. The "ability" school, established by He, Qi, Zhang, Zhou, Yao, etc., believe that instructional design ability refers to the underlying attitude of teachers to complete instructional design based on professional knowledge and teaching skills. The details are shown in table 2:

TABLE 2 Definitions of instructional design ability

Domains	Definitions	Author
Instructional design process	Ability demonstrated in the process of completing the analysis of instructional tasks, analysis of instructional objects, preparation of instructional objectives, selection and use of instructional methods, selection and use of instructional media and evaluation of instructional results.	Zhang et al (2004)
	The teacher's ability in optimizing the combination of the various aspects of the instructional process before the lesson.	Pang&Li (2010)
	The teacher's ability, which is performed in using a systematic and scientific approach before lessons and applying the principles of modern educational, learning and instructional theories to make specific plans for instructional objectives, content, instructional methods, instructional strategies and instructional evaluation.	Du (2011)

TABLE 2 (Continued)

Domains	Definitions	Author
	The ability which is referred to apply a combination of content analysis, learner analysis, analysis and preparation of instructional objectives, selection and application of instructional methods and media, and evaluation of instructional in instructional practice, as well as the level of motivation and awareness to apply instructional systems design thinking.	Liu et al (2012)
Problem solving	The ability which is referred to apply a systems approach to analyzing instructional and learning problems, designing solutions to instructional and learning problems, testing the effectiveness of solutions and making modifications accordingly.	Qin (2001) Liu et al (2009)
	Teachers' practical ability about analyzing and solving instructional and learning problems.	Chen (2013)
	The teacher's ability refers to the use of personal and curricular resources to design instruction for students, as well as to analyze and solve instructional problems during the process.	Qiao (2019)
Underlying attitude	A set of personal characteristics that enable teachers to effectively complete instructional design.	Qi & Zhang (2009)
	Concepts of instructional design and knowledge and skills of instructional design.	Li et al (2013)
	Basic abilities necessary for teachers to teach in the classroom.	Guan & Huang (2021)

The first definition of instructional design process is the most widely used and most consistent with the content of the instructional design process model which is primarily used in instructional practice; therefore, the first definition is employed in this research to define instructional design ability.

As part of the development of teachers' instructional design ability, three explicit incremental stages are followed: the first stage involves the ability to design instruction formally and write a complete and accurate teaching plan; the second stage of instructional design ability is the ability to complete a teacher-centered instructional design that conformed to the logic of the content; and the third stage of instructional design ability involves the ability to design instruction in a flexible and diverse way that is student-centered (Yu, 2010).

Since this research is conducted during the initial teacher education, instructional design ability is defined as the ability of designing a complete teaching plan based on instructional design theory.

2.2 The content of special education teachers' instructional design ability

The definition of instructional design ability provides a clear direction for its content. The researchers offer different perspectives on instructional design abilities' content based on the definitions.

TABLE 3 The content of instructional design ability

Author	Components of instructional design ability
Sheng & Li (1998)	Select and apply instructional media, prepare instructional objectives, analyze instructional objects, select and apply instructional methods, analyze instructional tasks and evaluate instructional outcomes.
Qin (2001)	Instructional and learning analysis ability, instructional strategies selection and design ability, instructional practice activities implementation and control ability.
Zhang et al (2004)	Instructional tasks analysis ability, instructional objects analysis ability, instructional objectives setting ability, instructional methods selection and using ability, instructional media selection and application ability, and instructional effectiveness evaluation ability.
Wang & Chen (2007)	Instructional tasks analysis ability, instructional objects analysis ability, instructional objectives design ability, instructional strategies selection ability, instructional media using ability and classroom instructional design evaluation ability.

TABLE 3 (Continued)

Author	Components of instructional design ability
Jia (2008)	Learner characteristics analysis ability; instructional content analysis ability; appropriate instructional objectives development ability; instructional strategies selection ability; classroom situations anticipating changes ability; conducting instructional evaluations ability.
Liu (2010)	Learner analysis ability, content analysis ability, instructional objectives analysis ability, instructional methods and strategies selection ability, instructional media selection ability, instructional evaluation design ability, instructional design plans preparation ability, and instructional design plans evaluation revision ability.
Jia (2008)	Learner characteristics analysis ability; instructional content analysis ability; appropriate instructional objectives development ability; instructional strategies selection ability; classroom situations anticipating changes ability; conducting instructional evaluations ability.
Liu (2010)	Learner analysis ability, content analysis ability, instructional objectives analysis ability, instructional methods and strategies selection ability, instructional media selection ability, instructional evaluation design ability, instructional design plans preparation ability, and instructional design plans evaluation revision ability.
Pang & Li (2010)	Instructional analysis ability (learner characteristics analysis ability, content analysis ability), instructional strategies selection ability (instructional methods selection ability, instructional media selection ability), classroom changes prediction ability, instructional evaluation ability.
Du (2011)	Students analysis ability, instructional objectives preparation ability, instructional content restructuration ability, instructional processes design ability, instructional strategies selection ability and the ability to design for flexibility.

TABLE 3 (Continued)

Author	Components of instructional design ability
Luo (2012)	Learning objects analysis ability, learning content analysis ability, instructional objectives articulation ability, instructional strategies development ability, lesson plans writing ability and instructional evaluations design ability.
Dong & Hong,2012	Learning objectives analysis ability, learner analysis ability, instructional content analysis ability, learning activities analysis ability, instructional organization analysis ability and instructional evaluation analysis ability.
Gu (2013)	Instructional objects analysis ability, instructional objectives analysis ability, instructional content analysis ability, instructional strategies analysis ability and instructional evaluation design ability.
He (2014)	Instructional tasks analysis ability, instructional objects analysis ability, instructional objectives analysis ability, instructional strategies selection ability, instructional media selection ability and classroom instructional evaluation design ability.

As can be seen from the table 3 above, although researchers have defined instructional design ability from three different perspectives, when analyzing the components of instructional design ability, researchers have also divided the components of instructional design ability into roughly three parts from the perspective of the instructional design process: analysis ability (instructional content analysis, learner analysis, etc.), design ability (instructional objective design, instructional strategy design, etc.), and evaluation ability.

The components of instructional design ability are clearly delineated through the lens of the instructional design process. Based on the similarities and differences between typical children and children with disabilities, and the instructional design model in special education, the inclusion of individual objective design within the

domain of design ability completes these three aspects as the instructional design ability content for preservice special education teachers (as shown in table 4):

TABLE 4 The content of instructional design ability for special education teachers

Ability	Content
Analysis ability	The ability of instructional content analysis and learner analysis.
Design ability	The ability of instructional objective design, individual objective design, instructional strategy design, instructional media design and instructional process design, etc.
Evaluation ability	The ability of evaluation criteria and method design.

2.3 Evaluation of instructional design ability

As a component of competency, the ability could be evaluated through results in effective performance demonstrated through behavior according to specified standards (Chouhan & Srivastava,2014; Megahed, 2018).

Typically, instructional design ability is assessed with questionnaires, interviews, observations, and text analyses (Guan&Huang,2021). Table 5 summaries the nature, common forms, data sources, advantages, and disadvantages of each evaluation method (Huang, 2019).

TABLE 5 The evaluation of instructional design ability

Evaluation method	Questionnaire	Interview	Observation	Text analysis
Nature	Quantitative	Qualitative	Qualitative	Qualitative
Forms	Questionnaire survey	Single/group Interview	Classroom teaching observation and video analysis	Teaching plans, reflections, and assignment corrections
Source of data	Questionnaire analysis	Language analysis	Language analysis and behavior analysis	Text analysis
Advantages	Convenient, large scale implementation, and easy data analysis	Abundant data types, high reliability, and wide range of applications	Abundant data types, highly objective, and available across geographies and times	Less disturbance to teachers, easy to operate
Disadvantages	Less flexible and instructive, and not deep enough	High interviewer requirements, difficult to quantify data, and collect on a large scale	High analyst competency requirements, difficult to detect intrinsic intent, and collect on a large scale	Difficult to quantify, one-sided, and demanding for analysts

As seen from the above table, each method has its own conditions and scope of application, along with advantages and disadvantages. Through a textual analysis approach, this study assesses the effectiveness of preservice teachers' instructional design abilities in their teaching plans. A scale was developed by the researcher based on the requirements of each aspect of instructional design, and this scale was used to evaluate the textual analysis content for comparing pretest and

posttest results. An expert collaborated with the researcher to score and enhance the accuracy and reliability of the data: they discussed the rating scale, scoring principles, and conducted tests to ensure alignment in criteria. Experts with a minimum of 20 years of experience in special education and 15 years in teacher training related to instructional design were selected for this study.

Based on the description of the specific instructional design ability and evaluation, the curriculum goals and sub-goals are determined, then the rubric and method are developed.

3. The Path of Instructional Design Ability Enhancement

Education, according to Whitehead (1967), is “the acquisition of the art of utilization of knowledge”. The core mission of professional education is reflected in his definition (Everwijn et al,1993): “how to make certain that knowledge acquired gets transformed into ability to apply”. Consequently, professional education should focus on integrating knowledge and practice in each unit (Gallacher&Johnson, 2019). For learners, learning occurs through three stages: surface, deep and transformation (Frey et al,2018): Surface learning refers to the learning of a single piece of content. Learners receive knowledge and through application, knowledge is deepened and mastered. Furthermore, learners acquire skills in the process of applying knowledge, which results in the translation of knowledge (Everwijn et al,1993); In deep learning, learners integrate multiple learning contents into a whole through communicating with others, discover connections, relationships, and diagrams between concepts, and learn how to organize skills and concepts, then aggregate various skills that have been acquired from the knowledge acquisition of the entire learning content; When the learners begin to apply newly acquired knowledge or skills in increasingly novel contexts, learning transformation occurs, the learners integrate practice in a new situation. "Knowledge acquisition" and "knowledge application" must be integrated into professional education curriculum (Everwijn et al,1993), for keeping the learners continuing to cycle through these three levels as learners' learning progresses (Frey et al,2018), to improve their performance (Everwijn et al,1993).

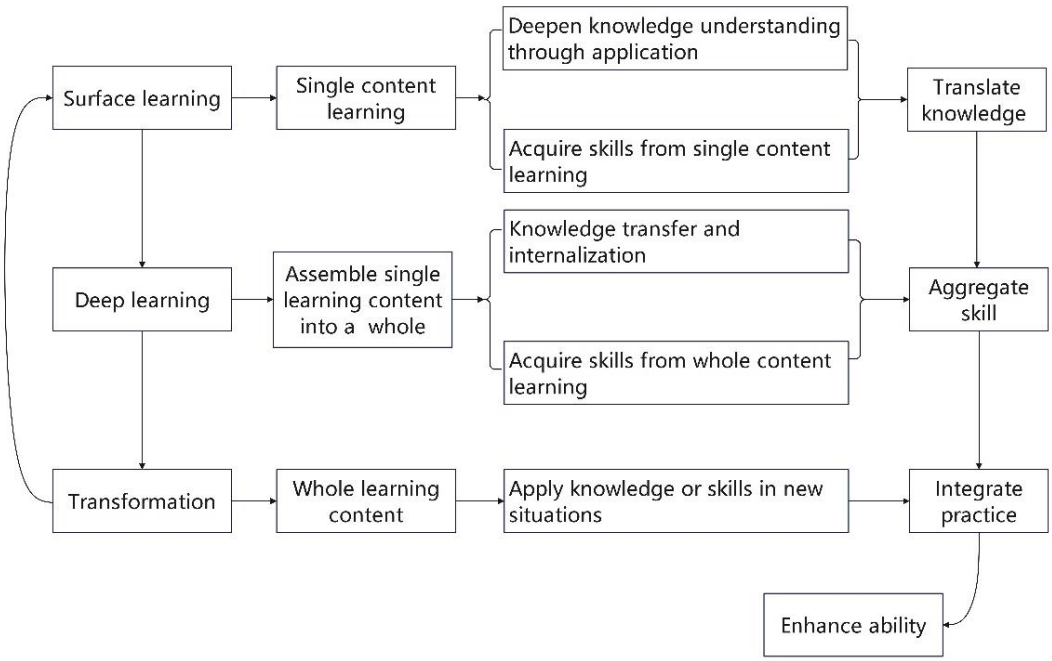


Figure 3 The path of instructional design ability enhancement

The pathway of instructional design ability enhancement is shown in figure 3: translate knowledge → aggregate skill → integrate practice. During the process of ability enhancement, knowledge leads to application, whereas application leads to a better understanding of knowledge, thus forming skills; By aggregating the skills acquired through a single learning content into a comprehensive overall learning content, learners are encouraged to think about the relationship between knowledge, organize individual skills, deepen the learning of knowledge, develop skills in new situational applications, and integrate the knowledge and skill into practice, thus enhancing their abilities. During the ability development process, by integrating knowledge acquisition and application, the complexity and difficulty of the exercises should increase over time, for promoting the deep learning of individuals and the continuous enhancement of their abilities (Fadde, 2009).

4. Mastery Learning Theory

Carroll (1989) develops a school learning model suggesting that when students are afforded sufficient time to learn at their own pace, they can master the content according to their ability. Based on Carroll's work, Bloom publishes a mastery learning theory that combines deliberate practice and repetition with the use of various instructional strategies by teachers to enhance the learner's experience and optimize learning potential. The theory states that when students achieved preset goals set at the beginning of instruction, mastery would occur, and students' success requires individualized formative assessment and adequate time to achieve it (Bloom, 1968).

4.1 The principles of mastery learning theory

4.1.1 All students could learn

Although there are individual differences among students, these individual differences are relatively stable and not easily changed, while the individual differences that students show in the learning process are a perceived phenomenon, and it is mainly due to inappropriate environments (Wang, 2011). Allowing each student enough learning time (Zhang, 2009), more than 90% of students could meet the requirements of the instructional objective (Qiao&Li, 2018).

4.1.2 Instruction for mastery

Teachers should believe in students' ability to master the learning content (Qiao & Li, 2018), give timely feedback to students, give individualized instruction, and continuously adjust the instructional process and change instructional methods so that instructional objective can be successfully achieved (Jing, 1999).

4.2 The learning process of mastery learning

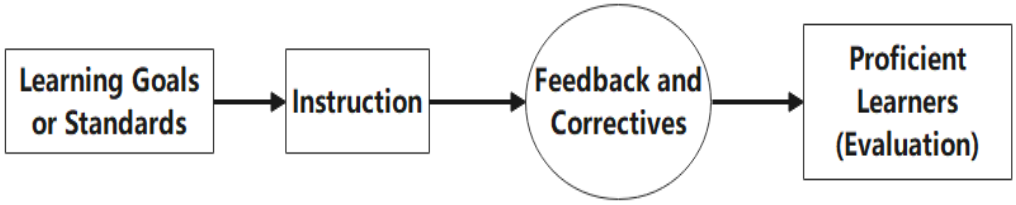


Figure 4 Major components in the instructional and learning process

by Thomas R. Guskey, 2007, Closing achievement gaps: revisiting Benjamin S. Bloom's "Learning for mastery", *Journal of Advanced Academics*, 19 (1), 8–31

According to Guskey (2007), mastery learning theory consists of four distinct components: clear learning objectives, instructional delivery, formative assessment with corrective measures, and performance evaluation.

In the implementation of mastery learning, the teacher determines the instructional content and make a formative assessment according to the instructional content. Formative assessment is extremely important. It is used to test the students' knowledge and provide the basis for the teacher's further guidance. If the student passes the first assessment, it means that the student has a good grasp of knowledge and the teacher's initial guidance is correct. To support ongoing improvement among these students, educators may offer a range of extension activities aimed at enhancing their understanding and skills. For students who fails to pass the formative assessment, teachers would provide them with rich learning resources or individualized tutoring, and conduct a second assessment after the second study to verify whether the tutoring measures really help students overcome their personal learning difficulties and provide students with a second chance to succeed (Guskey, 2005; Guskey, 2007).

4.3 Evaluation of mastery learning

There are three types of assessment in mastery learning: diagnostic assessment, formative assessment, and summative assessment (Jing, 1999). Diagnostic assessment is used to understand students' existing readiness; formative assessment allowed teachers to keep track of students' learning and make adjustments to instruction; and summative assessment is used to determine the appropriate level of student learning (Yang & Liu, 2007). Different types of assessment are ways to understand students' mastery of knowledge (Dai, 2018).

In mastery learning theory, there are principles, learning procedure, and evaluation. According to these, "All Students could Learn" becomes one of the curriculum principles. The learning process, "Instruction $\rightarrow$ Feedback and Correctives

→ Proficient learners", formed the learning procedure. In this research, learning achievement is evaluated using three types of assessments: diagnostic, formative, and summative.

5. Social Constructivism Theory

According to Yu (2018), social constructivism, rooted in Piaget's theory of cognitive development and Vygotsky's theory of psychological development, represents a significant branch of constructivist thought. Since social interaction and collaboration are incorporated into social constructivism, it is an extremely effective method of teaching. Social interaction is considered to be an integral part of learning by Vygotsky (1978). Introduced to the West in the 1970s, social constructivism merges with constructivist thinking to form a significant paradigm known as social constructivism. Both approaches liken knowledge acquisition to a process of construction or building. However, social constructivism is more concerned with the social aspect of the construction process (Yu, 2018).

5.1 The concept of social constructivism theory

Social constructivism is "a constructive dialectic" with three features of thinking: constructivism, the social nature of constructs, and the interactive nature of social constructs (An, 2003), and focuses on the process of knowledge production (An, 2005), arguing that learning occurs in real, task-relevant situations with peers, experts, or more senior people. Social constructivism argues that knowledge is constructed by constructors through interactions between constructors and constructors, and constructors and learning situations, based on prior experience (Tan & Tan, 2007).

5.2 Learning in social constructivism theory

5.2.1 Learning took place in interaction

According to social constructivist scholars, learning is an active process where learners independently discover principles, concepts, and facts (Brown et al., 1989; Ackerman, 1996). Amineh and Asl (2015) propose that individuals construct meaning through their interactions with others and their environment. In learning, learners and their peers and instructors are engaged in the learning task. Learners

participate in the task, generate ideas, share them, improve their knowledge understanding, and synthesize their own and others' ideas to complete the task. When learners are faced with doubts or conflicts, they would discuss the problem with someone, try to internally negotiate and socially negotiate the problem to gain consistent knowledge and understanding (Luo, 2012; Wu & Reeves, 2014). Learners may initiate their learning through collaborative activities such as pair work, group work, and teamwork (Amineh & Asl, 2015).

5.2.3 Realistic Situations could Facilitate the Learning of Useful Knowledge

Learning is a complex process of socio-cultural adaptation, as well as with real or highly likely real situations (Song, 2022). Knowledge is constructed based on the understanding of the culture in which people live and the situation in which it occurs, different social practices were sources of knowledge (Wang, 2018), learning is more effective in natural situations, and the environment in which knowledge is constructed was integral to the knowledge learned (Brown et al, 1989).

5.3 Teaching in social constructivism theory

5.3.1 Teaching method

According to The Assessment Reform Group (1999), educators can effectively observe and listen to students' descriptions of their work by posing open-ended questions and assigning tasks that necessitate the application of skills. Shunk (2012) suggest that social constructivism teaching emphasizes methods such as reciprocal teaching, peer collaboration, cognitive apprenticeships, problem-based learning, web quests, which anchor instruction, and other collaborative approaches.

5.3.2 The role of teachers

Teachers pose reflective, open-ended questions to gauge students' comprehension of concepts before offering their own insights, allowing ample time for students to establish connections and develop metaphors. During this process, teachers encourage student-teacher and student-student dialogue, engage students in experiences that contradict their initial assumptions, facilitate student discussion, and elaborate on their responses (Waston, 2001).

5.4 Teacher-student collaboratively constructed the instruction

Teachers and students are the dual subjects of instructional and learning activities (Song, 2022). In the learning activities, teachers create appropriate learning environments where learners could answer questions, draw conclusions on their own and constantly interact actively with learners (Rhodes & Belly, 1999). Learners are the center and subject of teaching activities and active builders of knowledge and significance (Wang, 2018).

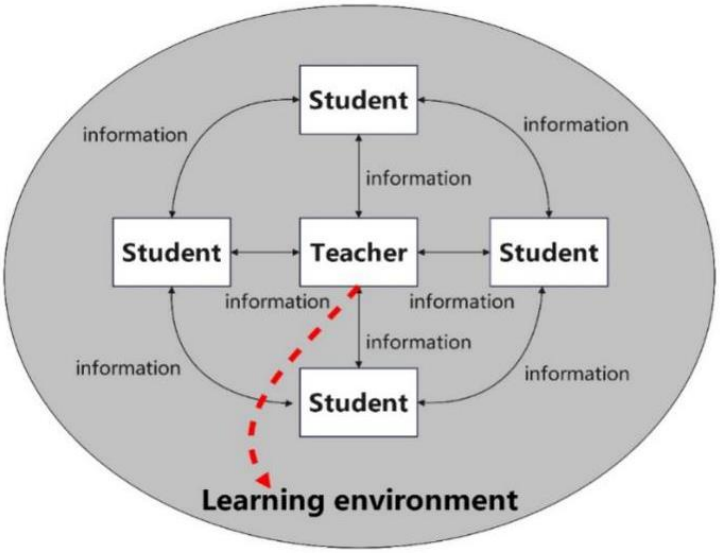


Figure 5 Instructional in social constructivism

Source: adapted from Jiang&Zeng (2017). Developing Professional Translators with a Social Constructivism Philosophy - Benefits of an Applied Translation Curriculum at the University of Hawaii

Figure 5 illustrates that students' learning occurs as they acquire knowledge through ongoing interactions with peers and teachers within an authentic learning environment constructed by teachers, tailored to students' current abilities.

5.5 Assessment

Assessment is viewed as an active process of revealing and recognizing shared understanding (Adams, 2006). Within social constructivism, assessment is seamlessly integrated into the learning and teaching processes. Teachers provide

support during instructional sessions, which also function as assessment moments. This dual role allows teachers not only to impart knowledge but also to gain insights into how concepts can be further developed and adapted. A social constructivist perspective emphasizes ongoing and dynamic knowledge construction. Assessment also serves as multiple opportunities for feedback and "feeding forward," highlighting the significance of employing discursive and collaborative strategies to engage learners in self- and peer assessment.

Based on social constructivism theory, learning activities are designed: teacher-student discussion, student-student discussion. Using the theory as a guideline, this research includes lectures, demonstrations, discussions, group learning, cooperative learning, and task-driven learning. Choosing curriculum materials and setting up the teaching environment is guided by the theory philosophy. Assessment becomes a part of teaching and learning. A variety of resources and strategies are provided to help students grow instead of focusing on whether or not they are right.

6. Relevant Research on Curriculum Development

6.1 The definition of curriculum and curriculum development

Currently, there are numerous definitions of curriculum. Analyzing these definitions can deepen individuals' understanding of the concept. The table below presents some of the most representative definitions of curriculum.

TABLE 6 Definitions of curriculum

Author	Definition of curriculum
Bobbitt (1918)	Curriculum encompasses the activities and experiences that children and youth must undertake to develop the skills necessary for competent adult life and to embody the qualities expected of adults.
Caswell & Campbell (1935)	Curriculum includes all the experiences children undergo under the direction of teachers.
Tyler (1949)	Curriculum is the means to achieve educational objectives, representing the behavioral changes that an educational institution aims to instill in its students.
Taba (1962)	A curriculum is a structured plan for learning.
Gagné (1967)	The curriculum encompasses the subject matter (content), terminal objectives, content sequencing, and preassessment of students' entry skills required at the start of the course.
Mauritz Johnson Jr (1967)	The curriculum consists of a methodically organized sequence of desired learning outcomes.
Oliver (1977)	The curriculum is an educational program divided into four primary components: the program of studies, the program of experiences, the program of services, and the hidden curriculum.
Saylor et al (1981)	The curriculum is a structured plan designed to provide various learning opportunities for individuals undergoing education.
Gay (1990)	The curriculum encompasses the entire culture of the school, encompassing more than just subject matter content.
Doll (1996)	The curriculum comprises both formal and informal content and processes through which learners acquire knowledge and understanding, develop skills, and undergo changes in attitudes, appreciations, and values within the context of enrolled schooling.

TABLE 6 (Continued)

Pinar et al (1996)	The curriculum is a symbolic representation that encompasses institutional and discursive practices, structures, images, and experiences that can be examined from various perspectives, such as political, racial, autobiographical, phenomenological, theological, international, and in terms of gender and deconstruction.
Ornstein &. Hunkins (2004)	The curriculum is a structured plan or written document that outlines strategies for achieving specific educational goals or objectives.
Tanner & Tanner (2006)	The curriculum involves systematically reconstructing knowledge and experiences to aid learners in developing intelligent control over future learning and experiences.
McKiernan (2007)	The curriculum encompasses the planning, implementation, learning processes, evaluation, and research activities conducted in educational settings across all levels of education.
Wiles & Bondi (2019)	The curriculum embodies a desired goal or a set of values that are actualized through a developmental process culminating in student experiences.

In these definitions, some theorists provide more detailed explanations, while others integrate aspects of both curriculum and instruction. These definitions of curriculum have distinct starting points, each serving its own purposes. When exploring the concept of curriculum, it is crucial to consider the social context, epistemological foundations, and methodological approaches together (Shi, 1994). In this research, the curriculum is defined as an educational program designed to enhance the effectiveness of learning, with learners engaging to achieve improved learning outcomes.

The term 'curriculum development' has been understood in various ways. For example, Barrow and Milburn (1990) characterize it as the process of reshaping or designing a curriculum in practice. Lewy (1991) defines it as "the preparation of an operational plan for implementing an existing syllabus." According to Alvior (2014), curriculum development is a systematic, purposeful, and gradual process aimed at

bringing about beneficial changes within the educational system. Curriculum development is considered a process for making programmatic decisions and revising materials like curriculum guides, specifications, benchmarks, and pacing guides, based on continuous and subsequent evaluations of their effectiveness (Gordon et al, 2019). In this research, curriculum development involves a comprehensive process, and consists of establishing curriculum principles, defining curriculum objectives, selecting and organizing curriculum content, planning curriculum implementation, and designing curriculum evaluation based on relevant theories.

6.2 Concepts of curriculum development

The concept of curriculum development illuminates the entirety of curriculum construction, illustrating how content selection, resolution of conflicting ideas, and ensuring continuity across levels address common issues in curriculum development. These concepts constitute the principles of curriculum development, thereby enhancing curriculum effectiveness. The concept of curriculum development encompasses eight aspects: scope, relevance, balance, integration, sequence, continuity, articulation, and transferability (Gordon et al,2019).

Scope. Scope is commonly understood as the breadth of the curriculum (Gordon et al., 2019). Saylor & Alexander (1954) defined scope as encompassing the breadth, variety, and types of educational experiences students encounter throughout their schooling. Key elements of scope include organizing centers or threads, aims procedure, and necessary decisions. Organizing centers or threads define the essential characteristics of the curriculum (Goodlad, 1963), guiding the selection of learning priorities, fundamental concepts, skills, and knowledge to be integrated into the curriculum. The aims procedure refers to the process of determining the curriculum's scope. Caswell & Campbell (1935) detailed this procedure as follows: first, establishing comprehensive overarching educational objectives covering all areas. Second, breaking down these objectives into a few highly generalized statements. Third, categorizing these statements based on the school's administrative structure (e.g., elementary, middle, or high school). Subsequently, specifying specific objectives for each subject to

further refine departmental goals. Finally, refining the overarching objectives of each departmental subject into specific grade-level objectives, describing as precisely as possible what each grade level is expected to achieve. Necessary decisions encompass choices across different subjects, courses, or units within the curriculum, addressing decisions within and across learning domains and diverse fields (Gordon et al., 2019).

Relevance. Relevance pertains to how the curriculum connects with everyday life. At its primary level, it involves skills that are applicable to daily living, while at its secondary level, it encompasses knowledge that may not be immediately observable (Smith, 1969). Curriculum experts collaborate with others to delineate the specific implications of relevance and endeavor to align curriculum content as closely as possible with this understanding (Gordon et al., 2019).

Balance. Halverson (1961) posits that a balanced curriculum requires structured and sequential scope and sequence (means) to achieve educational objectives (ends). Doll (1996) stresses that a balanced curriculum should encompass adequate content across diverse disciplines to meet individual educational needs and promote development. Achieving this goal necessitates balancing learner-centered and subject-centered education within the curriculum, harmonizing societal demands with individual learner needs, integrating general education with professional education, managing breadth alongside depth, reconciling personalized education with general education, and accommodating the needs of both special and non-special education students (Gordon et al., 2019).

Integration. Integration refers to the horizontal relationships among curriculum experiences (Tyler, 1949). In the context of curriculum construction, integration involves merging, combining, or unifying subject matters (Gordon et al., 2019). Subjects may be organized independently by discipline or integrated across school or classroom levels without strict adherence to disciplinary boundaries (Taba, 1962). Relevance in the curriculum represents a form of integration that connects relationships between subjects, either horizontally within a single grade level or vertically

across multiple grades, while preserving their individual characteristics (Gordon et al., 2019).

Sequence. Sequence refers to the systematic arrangement of educational experiences tailored for students (Saylor & Alexander, 1954). Methods of sequencing encompass organizing content from simpler to more complex, following chronological order, thematic arrangement, progression from concrete to abstract, and from general concepts to specific details, among other approaches (Gordon et al., 2019). Orlosky & Smith (1978) delineated three key concepts within sequencing: needs-based sequencing, macro sequencing, and micro sequencing. Needs-based sequencing allows learners to adjust the sequence of learning to meet immediate contextual demands. Macro sequencing involves structuring and delivering knowledge to align with various stages of individual development. Micro sequencing arranges subject matter based on the prerequisite knowledge essential for each content unit. When sequencing, considerations should encompass learners' maturity, background experiences, psychological age, interests, as well as the practicality and complexity of the subject matter (Smith et al., 1957).

Continuity. Continuity refers to the vertical alignment of essential curriculum elements, which is crucial for effectively structuring curriculum in a vertical manner (Tyler, 1949). It encompasses not just the repetition of content but also the gradual increase in cognitive complexity and the appropriate utilization of resources at each stage (Gordon et al., 2019). The principle of continuity is exemplified in spiral curriculum (Bruner, 1963). Planning a continuity curriculum necessitates profound disciplinary expertise and a comprehensive understanding of learners (Gordon et al., 2019).

Articulation. Articulation involves effectively integrating organizational elements across school levels, ensuring the sequential arrangement of content units in the curriculum plan so that each succeeding grade builds upon the foundation of the previous one (Gordon et al., 2019). This organizational approach encompasses both horizontal and vertical alignments, addressing gaps and overlaps between different levels, as well as personal articulation. Vertical alignment focuses on progression

between grades, whereas horizontal alignment emphasizes coherence within each grade level. According to Gordon et al. (2019), to mitigate gaps and overlaps in the curriculum, teachers must establish robust connections between grades and across school levels. Providing planning opportunities at the school level enhances curriculum alignment, while fostering schools as professional learning communities also aids in addressing these challenges.

Transferability. Achieving high levels of thinking and complexity in the curriculum, or reaching an applied level, facilitates learning transfer and long-term memory storage (Brown et al., 2014). Transferability, as highlighted by Gordon et al. (2019), is crucial in both instruction and curriculum design. Curriculum developers should define objectives, select content and appropriate levels of complexity, and employ teaching strategies that enhance transfer. Evaluation plans should include methods to assess transfer across different curriculum segments.

6.3 The Taba Model

Here are three situations in which the objective curriculum development model can be used: predetermined learning outcomes demonstrated by students' behavior, clear content, and objective evaluation of learning outcomes (Huang & Yang, 2021). Taba's model is also considered to be a further elaboration of Tyler's model, and it is viewed as a classical objective model (Bhuttah et al., 2018; Läänemets & Kalamees-Ruubel, 2013). Taba (1932) defines curriculum as a combination of experiences in schools. According to Taba (1962), a curriculum development process involves diagnosing needs, forming goals, selecting curriculum experiences, organizing curriculum content and learning experiences, and determining how and what to evaluate.

6.3.1 Diagnose needs

Curriculum development starts with the needs diagnosis and determines what students should know and be able to understand, their skills, and their mastery level (Taba, 1962). In addition to achieving diagnostics, learner diagnostics and problem diagnostics are also included in the needs assessment. Diagnosing students' achievement of important teaching objectives is part of achievement diagnosis; learning

diagnosis aims to understand their needs, interests, etc.; problem diagnosis is the teacher's diagnosis of curriculum problems, including identifying problems, analyzing them, forming hypotheses, collecting data, and carrying out experiments.

6.3.2 Form the objectives

In addition to diagnosing learners' needs, contemporary social life and the subject matter all contributed to objectives formulation. Learning activities and curriculum content are chosen according to the objectives. Goals are criteria for evaluating learning achievements, and they describe individuals' acquisition of knowledge, skills, and attitudes (Taba, 1945c). It is essential to describe the kinds of goals expected, state goals clearly and unambiguously, set realistic goals, and provide a variety of learning outcomes for which the school was responsible.

6.3.3 Select curriculum experiences

It is noted that learning experiences and content are included in the curriculum. Within the context of subject knowledge, content relates to the attainment of knowledge (Zhong, 2022). Student learning experiences are the learning activities they engage in. Learning activities should be selected and organized in conjunction with content selection and structuring.

As part of the Taba curriculum model, learning activities play an important role. When selecting curriculum experiences, Taba (1962) suggests the following principles: validity and importance of content; consistency with social reality; balance between breadth and depth; achieving a wide range of outcomes; learning and adaptability of student experiences; and relevance to students' interests and needs.

6.3.4 Organize curriculum content and learning experiences

After selecting curriculum experiences, the content must be organized logically and orderly in order to become a teachable curriculum. Curriculum organization is the central principle of curriculum development. The issue of curriculum organization is often related to the conflict between the logical organization of knowledge and the psychological organization of children (Taba,1962).

1) Establish the sequence

Taba (1962) focuses on the sequence of curriculum content organization from two perspectives: incremental learning and integration. In incremental learning, the complexity of content gradually increases as higher levels of thinking are acquired. Progressive learning progresses forward and builds on previous foundations. Through the continuous organization of curriculum content, understanding grows in breadth, depth, and complexity. In contrast, integration involves the integration of ideas, questions, methods, etc., across a wide range of curriculums that can be linked to individual learning experiences (Taba, 1932).

2) Combine the requirements of logic and psychology

Logic is determined by the relational structure of the discipline, and its logic follows the psychological order of learning and principles that allow the learner to internalize what he or she had learned. According to Taba (1962), the logical organization of the discipline is determined by the relational shape and selection of the disciplinary material.

3) Determine the focus of the curriculum

A fundamental concept, Taba (1962) believes, is the basis for the organization of a curriculum, as well as its direction, associations, and relationships with preservice teachers.

4) Provide diversity in learning

It is necessary to provide students with different learning activities to promote their self-development since their needs were different; students' interests are also different, so learning activities should be tailored to match students' interests, as well as to maintain a balance between learning styles (Taba,1962).

6.3.5 Develop the evaluation strategy, approach, and tools

During the evaluation process, Taba (1962) explains: identifying behaviors to be evaluated; developing and applying a variety of possible methods to obtain evidence of student change; describing and interpreting this evidence in an

appropriate manner; and improving curriculum, instruction, and learning guides based on the information gathered about student progress or deficits.

The Taba Model is utilized for curriculum development in this research, involving six stages: gathering foundational data for curriculum development, curriculum design, expert evaluation of the curriculum, pilot study, curriculum implementation, and curriculum evaluation and revision.

6.4 Relevant research on curriculum development of instructional design ability enhancement

Chen (2013) develops a micro online curriculum for enhancing the instructional design ability of the third-year preservice teachers major in Educational Technology at Central China Normal University. Chen employs literature review to gather foundational information and utilized design-based research method for curriculum development. To evaluate the curriculum's effectiveness, a combination of questionnaire surveys and comprehensive evaluation methods are used. The results indicate that the vast majority of learners successfully complete all curriculum units, and most learners self-assess as having achieved the expected learning objectives. However, it is noteworthy that learner engagement is relatively low in certain thematic modules, and some learners are unable to complete the coursework.

Cheng (2014) develops a curriculum aimed at enhancing the instructional design ability of second-year preservice teachers at the Hong Kong Institute of Education. Cheng collects baseline data through self-assessment questionnaires and interviews, integrating relevant theories and literature to develop the curriculum. Upon curriculum completion, Cheng conducts another round of self-assessment questionnaires and interviews for evaluation. The results indicate that the learning study significantly improve the pre-service teachers' instructional design ability.

Huang (2016) develops a curriculum focused on visualized instructional design ability for third-year preservice chemistry teachers at Ningxia University and Ningxia Normal University. Huang combines literature review and interviews to gather foundational information, employs action research for curriculum development, and uses case analysis and questionnaire surveys for evaluation. The research demonstrates that

the curriculum, with its rich content and diverse activities, successfully engage the preservice chemistry teachers. More importantly, the curriculum significantly enhances their instructional design ability, particularly in the use of software for instructional design, achieving remarkable progress.

Ma (2019) develops an inquiry-based science instructional design curriculum for third-year preservice science education teachers at Changchun Normal University. This research utilizes literature review and measurement to gather basic information, employs action research for curriculum development, and evaluates the curriculum through measurement and interview. The results reveal that the curriculum significantly enhance learners' knowledge of inquiry-based instructional design. As the curriculum progressed, learners' instructional design abilities steadily improved, and various types of learning activities positively influence their instructional design abilities.

Summary

While the content of instructional design ability has been clearly defined, encompassing analysis of instructional content and learner characteristics, designing objectives, strategies, media, and processes, as well as evaluating learning outcomes, there is currently a lack of research on personalized curriculum design specifically tailored for preservice special education teachers. This research gap necessitates exploration into how to integrate the core content of instructional design ability 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, gaps in enhancing instructional design ability for preservice special education teachers are identified.

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).

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

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.

This research seeks to address identified research gaps by developing a curriculum aimed at enhancing the instructional design abilities of preservice special education teachers, as well as evaluating the curriculum's effectiveness.

CHAPTER 3
METHODOLOGY

This curriculum on the instructional design ability of preservice special education teachers was a hybrid approach that used a continuous two-stage research pattern for exploratory design: starting with qualitative research methods, then continuing with quantitative research methods to determine the research cycle. The development was divided into two cycles and four stages: the first stage collected, analyzed, and synthesized basic information; the second stage developed the draft curriculum and conducted pilot experiments; the third stage implemented the curriculum with the target group; and the final stage evaluated the curriculum and made improvements.

1. Stage 1: Basic Information Study

The purpose of this stage was to analyze relevant data and gather essential information necessary for curriculum development. This stage encompassed five steps: literature research, in-depth interviews with teaching supervisors in special education schools and expert special education teachers, in-depth interviews with preservice special education teachers, content analysis, and instructional design ability assessment scale development.

1.1 Literature analysis

The researcher conducted a literature search on instructional design and instructional design ability, and subsequently structured the instructional design process and instructional design ability content. The researcher studied theoretical concepts theories in domestic and foreign the paper and related literature from 1980 to 2022, based on Thailand, China, Web of Science, ProQuest, EBSCO, Sage Journals, Science Direct, SpringerLink, Elsevier, Scopus, Google, and master's thesis and dissertation in various universities. The key words for searching include "instructional design", "instructional design ability", "instructional design competence", "instructional design competency" and "ability". The researcher examined instructional design and

instructional design ability, strategies for improving instructional design ability, and methods for evaluating instructional design ability based on these literatures.

1.2 In-depth interview with teaching supervisor in special education schools

1.2.1 Basic information of teaching supervisor in special education school

The criteria for choosing teaching supervisor was determined by:

- Teaching supervisor or principal responsible for instruction.
- At least 3 years' management experiences.
- At least 5 years' experience in mentoring inexperienced teachers.

Based on the interviewee criteria, the researcher identified three experts through methods such as referrals from acquaintances and self-recommendations. All three interviewees were vice principals with at least 3 years of management experience and over 5 years of experience in mentoring inexperienced teachers. Additionally, to ensure comprehensive data collection, consideration was given to geographical and professional background differences when selecting interviewees. Detailed information of experts can be found in the appendix A.

1.2.2 Instrument

Interview Protocol for teaching supervisors in developmental disability education schools was employed to collect the data.

Universities should develop talents that align with employers' needs by establishing professional curriculum tailored to meet these demands, thereby enhancing students' capabilities (Lin, 2012). The necessity for pedagogical instruction in instructional design lay in establishing the objectives and content of the curriculum. This interview protocol primarily addressed the instructional design ability required of novice teachers in schools catering to children with developmental disabilities, the challenges encountered by novice teachers in instructional design, and recommendations for refining the instructional design curriculum in preservice teacher training programs.

The interview protocol was designed by the researcher, aligning with the curriculum's components. It comprises four main questions: the difficulties in teacher trainees, the requirements of instructional design ability, factors influencing job interview success, suggestions for instructional design ability training, particularly focusing on

their pertinent experience in instructional design ability requirements and training. The interview questions aim to understand the professionals' views on special education teachers' learning needs in curriculum of *instructional design in special education*. It covered the status of the hopes for improving instructional design ability, and the content, methods, scheduling, and evaluation methods of the curriculum.

The researcher got feedback from three experts, including instructors who teach instructional design courses, instructors who train special education teachers in instructional design for children with developmental disabilities, and teaching supervisors from special education schools.

The experts provided the following suggestions for revising the interview protocol:

Teaching supervisors in special education schools had the responsibility of managing teaching and training teachers in instructional design. During interviews with teaching supervisors, the focus should be on the requirements, training content, methods, and evaluation criteria for instructional design, as well as the instructional design abilities of novice teachers in special education schools.

1.2.3 Data collection

The researcher conducted in-depth interviews, with each interview lasting approximately 60 minutes. Each teaching supervisor was interviewed once. Face-to-face interviews were conducted for local experts, while interviews with experts from other locations were conducted via Tencent Meeting, an online video conferencing tool. The procedure was as follows:

1)The researcher contacted the Graduate School to schedule interviews based on the availability and preferences of the interviewees. Srinakharinwirot University issued invitation letters to facilitate the researchers in conducting interviews using designated questions.

2) Conducted in-depth interviews using the interview protocols, and carried out in-depth interviews with experts at the agreed date, time, and location.

Information was gathered from at least 10 individuals, and interviews were concluded once information saturation was reached (i.e., no new information).

3) Conducted the interview with the teaching supervisors' consent, and if the teaching supervisor did not consent to audio recording, documented the significant information from the interview using pen and paper.

4) Checked the reliability of the collected data.

Establishing a good relationship between researchers and interviewees, based on mutual trust, will affect the accuracy and authenticity of information.

Confirm the accuracy of the information obtained by using carefully recorded interview results. If encountering unclear areas, contact the interviewee to clearly explain the information and confirm its accuracy and authenticity.

1.2.4 Data analysis

Initially, the collected data was transcribed into verbatim transcripts. Following the importation of the interview results into the computer, the researcher utilized the computer software to convert them into verbatim transcripts. Subsequently, researcher engaged to cross-reference these transcripts with the audio recordings for thorough verification. Finally, the researcher completed the verbatim transcripts, categorized their content according to the constituent elements of the curriculum, and extract keywords to be used in curriculum development.

1.3 In-depth interview with the expert special education teachers

1.3.1 Basic information of these expert special education teachers

The criteria for choosing teaching supervisor was determined by: at least 10 years' teaching experiences for children with developmental disabled children; won first prize in provincial teaching competition or provincial leading teacher or associate senior teacher.

Based on the interviewee criteria, the researcher identified three experts through methods such as referrals from acquaintances and self-recommendations. All three interviewees were expert teachers specializing in the education of children with developmental disabilities, each possessing over 20 years of teaching experience in this field. Additionally, to ensure comprehensive data collection, geographical and

professional background differences were taken into consideration when selecting the interviewees. Detailed information of experts can be found in the appendix A.

1.3.2 Instrument

Interview protocol for expert teachers of developmental disabilities was employed in this in-depth interview.

Expert teachers in developmental disability education schools were characterized by five key attributes, encompassing positive teaching sentiments and well-founded teaching knowledge (Xu & Dong, 2011). Their comprehensive theoretical understanding and practical acumen (Zheng, 2007) empowered them to scrutinize the establishment of instructional objectives, the curation of content, and the implementation methodologies at an elevated level, with a heightened focus on the cohesive progression across various instructional phases (Chen, 2018). Consequently, the instructional design ability of expert teachers served as a foundational pillar for this curriculum development endeavor. The interview protocol devised for adept special education educators encompassed the instructional design process, the requisite knowledge and competencies pertinent to instructional design, and recommendations for the curriculum of instructional design in preservice teachers' training.

The in-depth interview protocol was designed by the researcher, aligning with the curriculum's components. It comprises four main questions: their experiences in instructional design for developmental disabilities, the knowledge or skills used in instructional design for developmental disabilities, suggestions for instructional design ability training, particularly focusing on their pertinent experience in instructional design for developmental disabilities. The interview questions aim to understand the professionals' views on special education teachers' learning needs in curriculum of *instructional design in special education*. It covered the status of the hopes for improving instructional design ability, and the content, methods, scheduling, and evaluation methods of the curriculum.

The researcher obtained feedback from three experts, including instructional design instructors, educators specializing in training special education teachers for children with developmental disabilities, and experienced teachers from special education schools.

The experts provided the following suggestions for revising the interview protocol:

During interviews with expert special education teachers, the emphasis should be on the process of instructional design, as well as the challenges, training content, methods, and evaluation criteria for novice teachers in this field.

1.3.3 Data collection

The researcher conducted in-depth interviews, with each interview lasting approximately 60 minutes. Each expert teacher was interviewed once. Face-to-face interviews were conducted for local expert teachers, while interviews with experts from other locations were conducted via Tencent Meeting, an online video conferencing tool. The procedure was as follows:

1) The researcher contacted the Graduate School to schedule interviews based on the availability and preferences of the interviewees. Srinakharinwirot University issued invitation letters to facilitate the researchers in conducting interviews using designated questions.

2) Conducted in-depth interviews using the interview protocols, and carried out in-depth interviews with expert teachers at the agreed date, time, and location. Information was gathered from at least 10 individuals, and interviews were concluded once information saturation was reached (i.e., no new information).

3) Conducted the interview with the expert teachers' consent, and if the expert teacher did not consent to audio recording, documented the significant information from the interview using pen and paper.

4) Checked the reliability of the collected data.

Establishing a good relationship between researchers and interviewees, based on mutual trust, will affect the accuracy and authenticity of information.

Confirm the accuracy of the information obtained by using carefully recorded interview results. If encountering unclear areas, contact the interviewee to clearly explain the information and confirm its accuracy and authenticity.

1.3.4 Data analysis

Initially, the collected data was transcribed into verbatim transcripts. Following the importation of the interview results into the computer, the researcher utilized the computer software to convert them into verbatim transcripts. Subsequently, Subsequently, researcher engaged to cross-reference these transcripts with the audio recordings for thorough verification. Finally, the researcher completed the verbatim transcripts, categorized their content according to the constituent elements of the curriculum, and extract keywords to be used in curriculum development.

1.4 In-depth interview with preservice special education teachers

1.4.1 Basic information of interviewees

The sampling method for preservice special education teachers was: stratified random sampling was conducted based on students' academic performance. Random interviews were conducted among learners who achieved average scores between 60-69, 70-79, and above 80, with two participants selected from each score range.

Then six preservice special education teachers were selected, all of whom were female and aged 19-20.

1.4.2 Instrument

Preservice special education teachers interview protocol was utilized in the in-depth interview with preservice special education teachers.

The 'curriculum learning needs' were divided into individual learner needs and societal needs (Shu, 2004; Chen, 2009). Individual learner needs referred to differences in learning abilities among learners, individualized learning desires, learning

process requirements, and learning environment needs (Chen, 2009). Social needs mainly referred to the demands of society and employers for learners' knowledge and skills (Shu, 2004; Chen, 2009). Based on the definition of individual learner needs, the content of the interview protocol included: learning ability gap, individualized learning desires, learning environment requirements.

Considering learning ability gap, individual learner desires, learning requirements for instructional design in special education schools, the researcher developed the preservice special education teachers interview protocols. The interview questions aim to understand the preservice special education teachers' views on their learning needs in curriculum of *instructional design in special education*. It covered the status of the hopes for improving instructional design ability, and the content, methods, scheduling, and evaluation methods of the curriculum.

The researcher obtained feedback from three experts, including instructional design instructors, educators specializing in training special education teachers for children with developmental disabilities, and experienced teachers from special education schools.

The experts provided the following suggestions for revising the interview protocol:

it was important to interview learners, who were participants in the curriculum, to gather insights on their understanding of instructional design, as well as their needs and challenges in the learning process. The learning needs of the curriculum were categorized into two dimensions. The relationship between these two dimensions and three categories of respondents should be clarified and demonstrated. Theoretical models should be incorporated into a holistic system of learning needs

1.4.3 Data collection

The researcher conducted in-depth interviews, with each interview lasting approximately 30 minutes. Each preservice special education teacher was interviewed once. Face-to-face interviews were conducted. The procedure was as follows:

1)The researcher contacted the Graduate School to schedule interviews based on the availability and preferences of the interviewees. Srinakharinwirot University issued invitation letters to facilitate the researchers in conducting interviews using designated questions.

2) Conducted in-depth interviews using the interview protocols, and carried out in-depth interviews with preservice special education teacher at the agreed date, time, and location. Information was gathered from at least 6 individuals, and interviews were concluded once information saturation was reached (i.e., no new information).

3) Conducted the interview with the preservice special education teachers' consent, and if the expert preservice special education teachers did not consent to audio recording, documented the significant information from the interview using pen and paper.

4) Checked the reliability of the collected data.

Establishing a good relationship between researchers and interviewees, based on mutual trust, will affect the accuracy and authenticity of information.

Confirm the accuracy of the information obtained by using carefully recorded interview results. If encountering unclear areas, contact the interviewee to clearly explain the information and confirm its accuracy and authenticity.

1.4.4 Data analysis

Initially, the collected data was transcribed into verbatim transcripts. Following the importation of the interview results into the computer, the researcher utilized the computer software to convert them into verbatim transcripts. Subsequently, researcher engaged to cross-reference these transcripts with the audio recordings for thorough verification. Finally, the researcher completed the verbatim transcripts, categorized their content according to the constituent elements of the curriculum, and extract keywords to be used in curriculum development.

1.5. Content analysis

The researcher analyzed the requirements, content, and evaluation criteria outlined in the-issued documents for preservice special education teachers.

1.6 Instructional design ability assessment scale development

The researcher conducted a thorough review of relevant literature on instructional design and instructional design ability in special education, establishing frameworks for instructional design ability. Subsequently, an assessment scale was developed to evaluate instructional design ability. This scale encompassed various dimensions, including the analysis of instructional content and learners with special needs, the design of instructional objectives (both general and individual), instructional strategies, instructional media, instructional processes, and instructional evaluation. All these designs were tailored for learners with special needs. Users were instructed to rate each criterion on a five-level scale, aligning with corresponding standards for each level. Five experts were invited to assess the content validity, including the completeness and comprehensiveness of the questions.

1.6.1 The IOC check

5 experts assessed the Item Objective Consistency (IOC) of the instructional design ability assessment scale. The panel of experts consisted of three instructional design experts and two testing and evaluation experts. The criteria for selecting experts for checking the IOC of the instructional design ability assessment scale was as follows:

TABLE 7 The criteria for choosing experts for checking the IOC of the instructional design ability assessment scale

Experts	The criteria
Instructional specialist	-Associate Professor or Professor or had won prizes in teaching competition - Research in teaching at least 10 years - Had teaching experiences at least 10 years
Assessment and evaluation specialist	- Associate Professor or Professor - Research in assessment and evaluation at least 10 years
Special education expert teacher	- Senior Teacher - Won the first prize in the provincial teaching competition - Teaching disabled children at least 20 years - Had teachers' training experiences for at least 5 years

These experts were requested to indicate their opinions by marking "✓" in the blank spaces of the results: consistent, not sure, and inconsistent. Subsequently, the researcher computed the mean score for each item using the following rating scale: a score of 1 for consistent responses, 0 for not sure responses, and -1 for inconsistent responses. The standards and consistency average value:

0.50-1.00 consistent

-1.00-0.49 inconsistent

The average IOC value ranging from 0.80 to 1.00 indicated that all evaluations met the defined criteria. Subsequently, the researcher revised the scale based on expert opinions. Following this, a trial test of the scale was conducted. Non-research participants were requested to trial the scale based on the criteria, after which the researcher computed the internal consistency reliability. Based on these computed results, the scale was revised again. Afterward, three teachers were invited to pilot the use of this scale. These participants included two special education teachers from different schools in the same region, along with one researcher. The expressions and items were revised based on feedback provided by the three teachers who tested the scale.

The meticulous evaluation of the content validity of the instructional design ability assessment scale by a panel of five esteemed experts revealed a noteworthy outcome. The resultant average IOC, spanning from 0.8 to 1(as detailed in the Appendix D), served as a robust indication that each item meticulously aligned with the meticulously delineated criteria.

1.6.2 The results of reliability analysis

After trial test the checklist, the result of Reliability Statistics was shown below:

TABLE 8 The result of reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.927	.932	36

As shown in the table, the Cronbach's Alpha was 0.927, indicating that the checklist had a high level of reliability.

The researcher analyzed the Item-Total Statistics of the instructional design assessment scale and observed that the Corrected Item-Total Correlation for items 8, 9, 26, 34, and 36 were below 0.4(as detailed in the Appendix E). Despite this, removing these items did not result in a notable enhancement in the value of Cronbach's Alpha. Consequently, it was determined that no items should be excluded from the checklist.

1.6.3 Suggestions from experts

These experts suggested that:

1)In the section of analysis of learner with special needs, learning attitudes and attention analysis should be added.

2)The term "curriculum" in the item "The description of teaching objectives closely aligns with the subject matter, characteristics, and curriculum" should be changed into "curriculum standards".

3)The item "the goals in the teaching process should align with the activities of both the teacher and the students" should be changed into "establish the objectives of the teaching process by considering the knowledge points, teacher's activities, and student's activities."

4)The evaluation in the section of teaching process design for special needs should be concrete.

5)The key focus of the design for instructional media and instructional evaluation should be on should be on highlighting differentiation in item descriptions.

2. Stage 2: Curriculum Development

After completing the basic information research, the researcher developed a draft curriculum: instructional design ability in special education curriculum. Following the quality check of the draft curriculum for consistency and appropriateness by the experts, the researcher conducted a pilot study.

The purpose of this stage was to design a draft curriculum for enhancing instructional design ability of preservice special education teachers, check the quality by experts, then conduct a pilot study.

2.1 Draft curriculum design

This research integrated two systematic and pertinent approaches, namely curriculum development, to create an innovative curriculum and learning paradigm. In the research approach, the researcher conducted a comprehensive analysis of findings from literature reviews, in-depth interviews, and content analysis regarding instructional design and its foundational role in curriculum development.

Subsequently, Taba's model was employed in the development approach to create a curriculum specifically tailored for preservice special education teachers. This process encompassed addressing background information, establishing principles and objectives, selecting and organizing curriculum content, arranging learning activities, and designing evaluations. Following the pilot study, the curriculum underwent further revision based on the findings derived from the pilot study results. The steps undertaken in draft curriculum development process were as follows:

2.1.1 Step 1: formulation of curriculum principles

Based on an analysis of foundational data, learner needs, societal context in China, and fundamental curriculum development theory, the basic principles of the curriculum were formulated.

2.1.2 Step 2: formulation of curriculum objectives

The curriculum objectives were established to serve as a framework for determining instructional content and assisting instructors in grasping the curriculum's extent. Ensuring consistency between the objectives and curriculum principles, as well as incorporating diagnostic data on learner needs, was essential in goal formulation.

2.1.3 Step 3: selection of the curriculum content

The selection of curriculum content was guided by the instructional design ability content of special education teachers and tailored to meet the learners' needs. Moreover, the curriculum content was chosen to balance theoretical understanding with practical application, aiming to enrich both the breadth and depth of the curriculum. Based on the above principles, this research employed the special education instructional design model as the curriculum framework, and added theoretical learning experiences and practical application experiences. Based on the theoretical knowledge, and the learning process of competency, the learning activities included three stages and each class period.

2.1.4 Step 4: organization of the curriculum

Throughout this research, the curriculum was organized according to the logical sequence of knowledge itself. The progressive sequence and the laws of knowledge acquisition were applied to organizing the large module experience, and the curriculum organization of each lesson was based on mastery learning theory and social constructivism theory.

1) Establish the sequence

The logical sequence of knowledge. The first sequence was the logical sequence of knowledge itself, the special education instructional design model, analyzing—designing—evaluating.

Progressive sequence. On the basis of ability development stages and laws of knowledge acquisition, several stages of curriculum organization were designed. At each stage, theoretical and practical experience was provided, curriculum materials, teaching methods, and teaching environments.

2) Combine the requirements of logic and psychology

By combining logic and psychology, which was based on the learning sequence of psychology to produce continuous cumulative learning, learners would be able to follow the learning sequence and internalize knowledge. The curriculum content was organized in accordance with the laws of knowledge learning.

First, theoretical experiences were learned and applied in practice; second, theoretical experiences were integrated and applied in practice.

3) Determine the focus of the curriculum

Theory-practice divide is a core dilemma in initial teacher education (Darling-Hammond,2006). To bridge the gap between theory and practice, this curriculum emphasizes both the comprehension of theoretical knowledge and its practical application.

4) Provide diversity in learning

According to the needs and interests of the learners, lecture, independent thinking discussion, peer learning, group learning, cooperative learning etc. were provided in this research.

2.1.5 Step 5: determination of assessment and evaluation

In this research, ability results in effective performance demonstrated through behavior according to specified standards. Therefore, the researcher examined the learning effectiveness of the curriculum by analyzing the performance of the teaching plan design. The evaluation was divided into two parts: formative evaluation and summative evaluation.

2.2 Quality check of the draft curriculum

2.2.1 Basic information of the experts

The criteria for choosing experts of curriculum quality checking was as follows:

TABLE 9 The criteria for choosing experts of curriculum quality checking

Experts	The criteria
Curriculum development specialist	- Associate Professor or Professor - Research in curriculum development at least 10 years
Instructional specialist	- Associate Professor or Professor or had won prizes in teaching competition - Research in teaching at least 10 years - Had teaching experiences at least 10 years
Assessment and evaluation specialist	- Associate Professor or Professor - Research in assessment and evaluation at least 10 years
Special Education Specialist	- Associate Professor or Professor - Research in special education at least 20 years
Special education expert teacher	- Senior Teacher - Won the first prize in the provincial teaching competition - Teaching disabled children at least 20 years - Had teachers' training experiences for at least 5 years

The researcher invited 5 experts to check the quality of the curriculum, post-Curriculum Implementation Interview for preservice special education teachers, then calculated the data. The details of these experts were shown in appendix A.

2.2.2 Instrument

1) Consistency checking form

The consistency assessment focused on the internal coherence of curriculum elements, including alignment between curriculum principles and objectives, objectives and curriculum content, and content and instructional methods. A three-point rating scale questionnaire was utilized, offering the options of consistent, not sure, and inconsistent. On this scale, a value of 1 point indicates consistency, 0 points indicates not sure, and -1 point indicates inconsistency.

The standards and consistency average value:

0.50-1.00 consistent

-1.00-0.49 inconsistent

2) Appropriateness checking form

This assessment was employed to evaluate the appropriateness of curriculum components, including curriculum principles, objectives, content, instructional methods, instructional materials, and assessment and evaluation. It utilized a five-point rating scale questionnaire format, with ratings ranging from very high level to very low level, to assess the appropriateness of each element. The appropriateness level is measured on a scale where a value of 5 points indicates a very high level, 4 points indicates a high level, 3 points indicates a moderate level, 2 points indicates a low level, and 1 point indicates a very low level.

The standards and appropriateness average value:

1.00-1.49 below the average level

1.50-2.49 low level

2.50-3.49 medium level

3.50-4.49 reasonable level

4.50-5.00 suitable level

2.2.3 Data collection

1) The consistency of the curriculum

The experts marked "✓" in the blank spaces of the results according to their opinions, and the researcher calculated the mean score of each item based on these markings. Additionally, the researcher collected suggestions for improving the curriculum's consistency.

2) The appropriateness of the curriculum

The experts marked "✓" in the blank spaces of the results according to their opinions, and the researcher calculated the mean score of each item based on these markings. Furthermore, the researcher collected suggestions about improvements to enhance the appropriateness of the curriculum.

2.2.4. Data Analysis

1) The consistency of the curriculum

The researcher analyzed the mean score of the consistency evaluation form. A score above 0.5 indicated that the curriculum exhibited consistency. However, if the score fell below this threshold, the researcher should consider making improvements to the curriculum before proceeding with implementation.

2) The appropriateness of the curriculum

The researcher evaluated the mean score of the appropriateness assessment form. A score exceeding 3.5 indicated the curriculum's appropriateness. However, if the score fell below this threshold, the researcher should consider making improvements to the curriculum before proceeding with implementation.

2.3 Pilot study

The researcher conducted a pilot study to assess the quality and feasibility of the draft curriculum before its implementation. Collaborating with relevant authorities, the researcher requested a trial curriculum and shared its details. Another junior student, selected by the researcher, oversaw the pilot study, which included 40 participants with prior knowledge similar to that of the sample group. The pilot study took place from September to October.

3. Stage 3: Curriculum Implementation

After several revisions, the researcher implemented the curriculum within the research sample. Afterward, the researcher evaluated the instructional design abilities of preservice special education teachers, conducted in-depth interviews, and assessed the curriculum's effectiveness. Using these findings, the researcher refined the curriculum further, culminating in the final version. The purpose of this stage is to evaluate the effectiveness of the curriculum, identify any issues within it, make necessary improvements, and develop the final version of the curriculum.

3.1 One group time series design

The researchers utilized multi-stage sampling technology to select a sample of preservice special education teachers from Chongqing Normal University who were in

their third year of university (n=32, male=3, female=30) as a single group. Then the researcher collaborated with the relevant authorities to request a trial curriculum and shared its details. Before implementing the curriculum, the researcher employed an instructional design ability assessment scale to evaluate Teaching Plan 1 and gathered baseline data. Subsequently, the revised curriculum (48 class periods, 45minutes per class period) was implemented from December 2023 to January 2024. Throughout the implementation, at the knowledge translation stage, after instructing each unit, the researcher assessed instructional design ability of the preservice special education teachers after each instructional unit to monitor their learning progress. During the skill aggregation and integration practice stages, the researcher assessed Teaching Plans 2 through 6 to evaluate the instructional design abilities of preservice special education teachers before on-site teaching. Following the curriculum implementation, the researcher assessed Teaching Plan 7 to evaluate the instructional design abilities of the preservice special education teachers. Furthermore, interviews were conducted with the participants to evaluate their learning outcomes and collect feedback and suggestions regarding the curriculum.

Campbell and Stanley (1963) introduced symbols and conventions in experimental and quasi-experimental designs: X represented the exposure of a group to an experimental variable or event, the effects of which are to be measured; O referred to the process of observation or measurement. The details were as follows:

TABLE 10 The details of one group time series design in the curriculum implementation

Stage	Measurement	Instructional content/Event
Pretest	O-pre	Before curriculum
Stage 1	O1	X1(Unit 1: Instructional content analysis)
	O2	X2(Unit 2: Analysis of learners with special need)
	O3	X3(Unit 3: Instructional objective design)
	O4	X4(Unit 4: Individual instructional objective design for learner with special need)
	O5	X5(Unit 5: Instructional strategy design for learner with special need)
	O6	X6(Unit 6: Instructional media design for learner with special need)
Stage1	O7	X7(Unit 7: Instructional process design for learner with special need)
	O8	X8(Unit 8: Instructional evaluation design for learner with special need)
Stage 2	O9	X9(Teaching plan 2)
	O10	X10(Teaching plan 3)
	O11	X11(Teaching plan 4)
	O12	X12(Teaching plan 5)
Stage 3	O13	X13(Teaching plan 6)
Posttest	O-post	After curriculum

After implementing the curriculum, the researcher in-depth interviewed 3 volunteers about their gains, deep impressions and suggestions in the revised curriculum.

3.2 Instrument

3.2.1 Instructional design ability assessment scale

This assessment scale focused on evaluate the instructional design ability of preservice special education teachers, including the instructional content analysis, analysis of learners with special needs, instructional objective design, individual

instructional objective design for learners with special needs, instructional strategy design for learners with special needs, instructional process design for learners with special needs, instructional media design for learners with special needs.

The rating scale was shown as below:

The appropriate level	Scale value (points)
No relevant information	= 1
A few relevant statements	= 2
Some relevant statements	= 3
Complete relevant statements	= 4
High-quality statements	= 5

3.2.2 Post-curriculum implementation interview for preservice special education teachers

The researcher conducted a thorough review of relevant literature on curriculum evaluation, establishing frameworks for this process. Subsequently, the researcher developed interview protocols aimed at capturing insights into the gains experienced with the curriculum, deep impressions towards it, and recommendations for future curriculum development. Five experts were invited to assess the content validity, completeness, and comprehensiveness of the questions. Additionally, three teachers were invited to trial the use of the interview protocols. These participants comprised two special education teachers from different schools within the same region, along with one researcher. The expressions and items were revised based on feedback provided by the three teachers who trialed the interview protocols.

3.3 Data collection

3.3.1 Instructional design ability assessment scale

The users marked "✓" in the blank spaces of the results according to their opinions. According to the scale value, the researcher calculated the point of each item.

3.3.2 Post-curriculum Implementation Interview for preservice special education teachers

The researcher conducted on-site interviews with preservice special education teachers from the sample group. During the interview, the researcher encouraged them to actively engage in talking and attentive listening. After obtaining consent from the interviewees, the researcher recorded the interviews and organized the resulting documents. The interviews lasted between 10 and 15minutes. To ensure the accuracy of the interviews, after each interview, the assistant had to submit the interview transcripts to the interviewees for perusal and make corrections and additions where appropriate to ensure that the content of the transcripts was consistent with the views articulated by the interviewees. All materials were transcribed from the record and used as a source for later data analysis.

3.4 Data analysis

3.4.1 Instructional design ability assessment scale

The researcher used computer software to analyze mean scores before, during, and after implementing the curriculum, and conducted paired-sample t-tests to compare pretest and posttest mean scores.

3.4.2 Post-curriculum Implementation Interview for preservice special education teachers

The researcher transcribed the key ideas from the in-depth interviews verbatim and conducted an inductive thematic content analysis on the collected interview data. Subsequently, the researcher assessed the participants' learning outcomes and gathered their feedback and suggestions on the curriculum.

4. Stage 4: Curriculum Evaluation and Improvement

To gather learners' perspectives on the curriculum and improve its revisions, the researcher analyzed the data during three learning stages, pretest and posttest, and the post-curriculum implementation interview for preservice special education teachers, to evaluate the effectiveness of the curriculum and made improvements of the curriculum.

4.1 Effectiveness criteria

The researcher developed a set of effective criteria for this curriculum. The criteria were shown as follows:

After the curriculum implementation, the instructional design ability of preservice special education teachers was higher than before.

The instructional design ability of preservice special education teachers had been enhanced before, during, and after implementing the curriculum.

4.2 Curriculum improvement

The researcher compared the analysis results with the established criteria to determine the effectiveness of the curriculum in enhancing instructional design ability of preservice special education teachers. Subsequently, the researcher incorporated feedback from experts and participants to make improvements to the curriculum.

CHAPTER 4
RESERCH RESULTS

In this research, a series of curriculum development techniques were employed to develop a curriculum for enhancing the instructional design ability of preservice special education teachers, which was conducted in two stages: first using qualitative research methods, and second using quantitative research methods. This research involved a hybrid method of curriculum development (Mixed Method). Four sections were included in the research results:

Section 1 Results of basic information study

Section 2 Results of curriculum development

Section 3 Results of curriculum implementation

Section 4 Results of curriculum evaluation and improvement

1. Results of Basic Information Study

1.1 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 courses 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, as illustrated in the figure below.

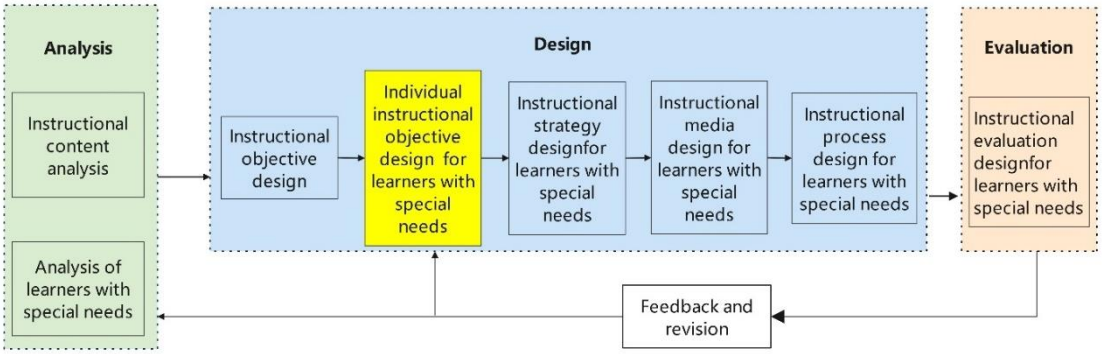


Figure 6 Instructional design in special education

According to the figure provided, compared to the instructional design model in regular education, the instructional design model in special education included individual instructional objective design for learners with special needs. Moreover, considering the physical and mental characteristics of special children, the relevant components were added to include the necessary considerations for instructional design in special education. The details were presented in the following table:

TABLE 11 The content of instructional design model in special education

Module	Element	Content
Analysis	Instructional content analysis	Analysis of background, functions, structure, elements, learning types, and tasks.
	Analysis of learners with special needs	Analysis general characteristics, types and degrees of disabilities in children with disabilities and Sensory perception status; Analysis of characteristics of cognitive development, starting level, learning style, learning motivation, learning attitude and attention.
Design	Instructional objective design	The precise and explicit outcomes expected to be achieved after designing the learning of a specific knowledge.
	Individual instructional objective design for learners with special needs	Specific and concrete outcomes that learners with different starting levels expected to achieve after learning a certain knowledge.
	Instructional strategy design for learners with special needs	The overall arrangement and plan of the entire teaching process included the individual sequence of teaching activities, teaching methods, teaching materials, teaching order, and forms of teaching organization.
	Instructional media design for learners with special needs	Selection of teaching media and assistive technology, and design of the timing, methods, steps, and frequency of presentation.
	Instructional process design for learners with special needs	Using teaching content as a medium, teachers and students engaged in individual activities to explore truth.
Evaluation	Instructional evaluation for leaners with special needs	The individual criteria and methods for evaluation.

1.2 Results of in-depth interview

1.2.1 In-depth interview results from teaching supervisors

1) Newly hired teachers faced challenges in instructional design.

Teachers must possess a thorough comprehension of the textbook they would be teaching and the fundamental concepts within it. Analyzing the textbook served as the initial stage in instructional design, as it entailed interpreting the teaching materials. The precision and thoroughness of this interpretation significantly impacted the quality of instructional design. Unfortunately, many novice teachers lacked the awareness or struggle to understand the content of the textbook, identified its key points, and aligned objectives with the nature of the subject. Consequently, they encountered challenges in interpreting the textbook and formulating instructional objectives.

Many novice teachers have never analyzed the textbooks (Supervisor A).

They lacked a sufficient understanding of teaching objectives (Supervisor B).

They had difficulties in understanding the essence of the discipline and incorporating it into the curriculum standards for this subject (Supervisor C).

I believe their 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).

2) Knowledge and skills required for novice teachers in the field of developmental disabilities education.

Generally, the teaching process consisted of several stages, introduction, new lesson teaching, consolidation, and conclusion. At developmental disabilities education School, it was expected that novice teachers possessed a solid understanding of the theoretical knowledge associated with each stage of the teaching

process. They should be able to effectively apply this knowledge to interpret textbooks, establish clear teaching objectives, design comprehensive lessons that incorporate all stages, and skillfully engage students while implementing their teaching plans.

Firstly, this lesson is complete. Secondly, the lesson plan has explicit teaching objectives. Thirdly, when the lesson is intended for lower grades, the teaching activities need to be attractive to capture students' attention. Moreover, these activities should align with the designed objectives. Finally, it is a fundamental requirement for understanding the textbook and the objectives (Supervisor A).

At least the structure of the teaching plan is complete. No matter how well he did, he didn't miss anything at least (Supervisor B).

The core components of an instructional design should include the following five elements: introduction, new lesson teaching, summary and recapitulation, consolidation exercises, and post-class activities. These five sequential steps should be followed by novice teachers when teaching (Supervisor C).

The most important thing is that they have clear teaching procedures and successfully implement them during instruction. If the overall atmosphere is relatively good and the children enjoy their classes, then it's okay (Supervisor D).

3) Suggestions for the curriculum "instructional design in special education".

Curriculum standards played a crucial role in guiding instructional design. Educators were advised to guide students in analyzing the curriculum standards and determining the instructional design direction when teaching this course. Additionally, it was essential to enhance the teaching of relevant theories in instructional design, integrate theoretical instruction with practical application, apply theoretical guidance in practice, and help students apply and comprehend theories practically. Regarding teaching methods, cooperative learning could be employed to facilitate students' comprehension of the logical connections between theoretical knowledge through collaborative group work. By implementing the teaching process, students

could reflect on instructional design and enhance their understanding of the generative nature of instructional design.

Teaching design, I firmly believe that teachers should initially comprehend and interpret the curriculum standards for developmental disabilities. Additionally, it is essential to establish a resource library for this curriculum, enabling learners to observe and derive valuable insights from exemplary lessons (Supervisor A).

I think theoretical teaching should be strengthened (Supervisor B).

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 C).

1.2.2 In-depth interview results from expert special education teachers

1) How to complete instructional design.

Expert teachers typically prioritized the essential elements of instructional design when developing their teaching plans. They commenced by thoroughly examining the content of the textbook, and followed by a comprehensive analysis of the learners. Subsequently, they established teaching objectives and personalized learning targets based on this evaluation. Lastly, they devised activities for each phase of teaching, taking into account the teaching content and objectives. These stages encompassed both the dissemination of new knowledge and the inclusion of practice exercises.

I begin by analyzing several key concepts addressed in the textbook material. Subsequently, I assess the overall class dynamics and ascertain their initial proficiency levels. Following this, I formulate general teaching objectives as well as personalized learning goals. Finally, I design the teaching process (Expert teacher A).

I will first identify the teaching objectives, and then design teaching activities based on these objectives. For example, if there could be three activities, with the first two focusing on new content and the third involving practice (Expert teacher B).

It is essential to determine the students' abilities and the content of the textbook. After that, it is crucial to effectively determine the teaching method. Lastly, the design process should proceed gradually by following each stage in the teaching process (Expert teacher C).

2) The knowledge and skills required for instructional design in developmental disabilities teaching.

According to expert teachers, novice teachers should acquire a comprehensive understanding of the various stages involved in the instructional design process. They should be able to design explicit teaching objectives, design effective instructional strategies, and successfully implement them by applying the knowledge and skills they have acquired.

Firstly, it is important to accurately assess interdisciplinary teaching objectives. Secondly, the teaching design should be innovative and effectively implemented according to the original teaching plan (Expert teacher A).

The knowledge and skills involved in each section of the instructional design process (Expert teacher B).

3) Suggestions for the curriculum "Instructional Design in Special Education".

This curriculum was a comprehensive curriculum that required learners to be familiar with the physical and mental characteristics of children with different developmental disorders, teaching strategies, the content system of subject teaching and rehabilitation, and the curriculum standards issued by the country. Furthermore, it aimed to equip learners with the knowledge and skills necessary for effective teaching design. In light of these objectives, expert teachers recommended integrating both theoretical and practical aspects into the teaching process.

Additionally, they advised to incorporate the interpretation of national curriculum standards and the development of basic teaching skills into the curriculum.

It is recommended to teach theory and practice sequentially according to the instructional design process, enabling learners to clearly understand the entire instructional design framework (Expert teacher B).

Enhance the interpretation of national curriculum standards in the curriculum and strengthen the training of teachers' basic skills, such as teaching demeanor and oral communication (Expert teacher C).

1.2.3 In-depth interview results from preservice special education teachers

1) The knowledge and skills currently acquired about instructional design in Special Education.

Instructional design required learners to be familiar with the physical and mental characteristics and teaching strategies of different developmental disabilities, as well as the knowledge systems of different subjects. These learners were in their third year of university and had studied some foundational courses in their major. However, they had not taken any directly related curriculum before studying "Instructional Design in Special Education." Only a few learners who had part-time teaching experience could use templates to write teaching plans, but they did not understand what instructional design was.

I have not taken any relevant curriculum about instructional design before, but I have written teaching plans based on templates during my part-time work outside of school (Learner 1).

Previously, I did not take any curriculum related to instructional design (Learner 2).

I never had curriculums about instructional design (Learner 3 and 4).

2) Knowledge and skills hoped to acquire in this curriculum.

College students in their third year had completed numerous curriculums in their major and had acquired a thorough understanding of their chosen field. They had formed various perspectives on their field of study. When questioned

about their expectations for this curriculum, all interviewees expressed their desire to comprehend the instructional design process and develop a pedagogically-sound and feasible teaching plan.

I hope I can write a teaching plan that is highly logical and implementable (Learner 1).

I want to learn the process of instructional design (Learner 2).

I want to learn how to complete individualized instructional design (Learner 3).

I hope to write lesson plans under theoretical guidance (Learner 4).

I hope I can write a complete lesson plan (Learner 5).

3) Learning environment demanded in curriculum of “instructional design in special education”.

Classroom organization forms each had their own advantages, disadvantages, and emphases. To enhance the effectiveness of classroom teaching, it was recommended to integrate multiple organizational forms. Furthermore, this curriculum encompassed both theoretical knowledge and the practical application of that knowledge. In terms of teaching methods, instructors should offer learners opportunities to practice while explaining theoretical concepts. This allowed learners to apply theoretical guidance to practical scenarios and enhance their comprehension of the subject matter. Interviewees also expressed their desire for the adoption of various classroom organizational forms, which combined lecture-style teaching with practical methods and facilitated timely discussions. Additionally, the provision of practical cases as teaching materials was suggested.

Employing a combination of whole-class instruction, one-on-one tutoring, and group learning strategies. Incorporating both explanation and demonstration into teaching, and providing subsequent opportunities for practice and independent application (Learner 1).

I prefer the instructor combine different classroom organizational forms in the teaching. I hope that teachers can utilize both lecture and practice methods

to convey knowledge and facilitate small group discussions when appropriate (Learner 2).

I find one-on-one tutoring to be stressful. I would rather have a combination of teaching methods that include lectures, demonstrations, and practical examples (Learner 3).

One-on-one guidance is undoubtedly superior; however, it may not always be feasible in practice. Alternatively, a combination of various instructional approaches can be considered. Personally, I prefer a teaching method that involves both explanation and practice (Learner 4).

4) Specific requirements for the extracurricular environment in curriculum of “instructional design in special education”.

Engaging in teaching practice offered learners valuable opportunities to apply their theoretical knowledge and reflected on instructional design in a practical setting. Working with developmental children allowed learners to gain valuable teaching experience. A majority of learners interviewed expressed a strong desire to participate in the special education classroom teaching provided by instructors.

I hope there will be real opportunities to teach developmental children (Learner 2).

I hope to have practical opportunities in the curriculum, such as teaching developmental children (Learner 3).

I have a fondness for interacting with children, and I would greatly appreciate the opportunity to be a teacher in teaching them (Learner 4).

5) The resources expected to be provided by the curriculum.

Well-designed teaching plans and videos could offer learners numerous examples of instructional design and provide them with a comprehensive learning experience. The textbook and slides presented the content system of the curriculum, enabling learners to review and enhanced their understanding of the knowledge. The vast majority of the randomly selected interviewees expressed a desire

for teachers to provide slides and textbook. Additionally, they expected teachers to offer more classroom teaching videos and teaching plans, which would enable them to learn how to design instruction through practical examples.

High-quality teaching videos and teaching plans (Learner 1).

We would appreciate it if the instructor could provide us with classes in which we can teach (Learner 2).

Slides and textbook (Learner 3).

A textbook is organized according to the teaching theme by the instructor (Learner 4).

I hope the curriculum will include a variety of high-quality teaching plans and textbooks (Learner 5).

1.3 Results of content analysis

Currently, the policy documents issued in China regarding special education teachers included "Professional Standards for Special Education Teachers" and "Occupational Ability Standards for Preservice Special Education Teachers (Trial)". These two documents had the following requirements for the instructional design ability of special education teachers, as listed in the table below.

TABLE 12 The results of content analysis

Document	Requirement for instructional design ability
Professional Standards for Special Education Teachers	The special education teachers should develop individualized teaching activity plans and adjust objectives and content according to the teaching content and learners' characteristics.
Occupational Competency Standards for Preservice Special Education Teachers (Trial)	The preservice special education teachers should familiarize with the curriculum standards and textbooks, analyze students' starting level, learning experiences, and interests, design appropriate learning objectives and focal points, design overall learning plans based on unit content or themes, select appropriate learning resources and teaching methods, and create lesson plans.

The above documents provided a detailed description of the instructional design ability of special education teachers. Currently, national policy documents required special education teachers to possess instructional design ability, 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.

Based on literature analysis, in-depth interview and content analysis, it was evident that theoretical knowledge about instructional design models in special education was essential, and preservice special education teachers must master it.

2. Results of Curriculum Development

2.1 Results of draft curriculum development

Based on the basic information study, the researcher employed related theories to develop draft curriculum (as shown in figure7).

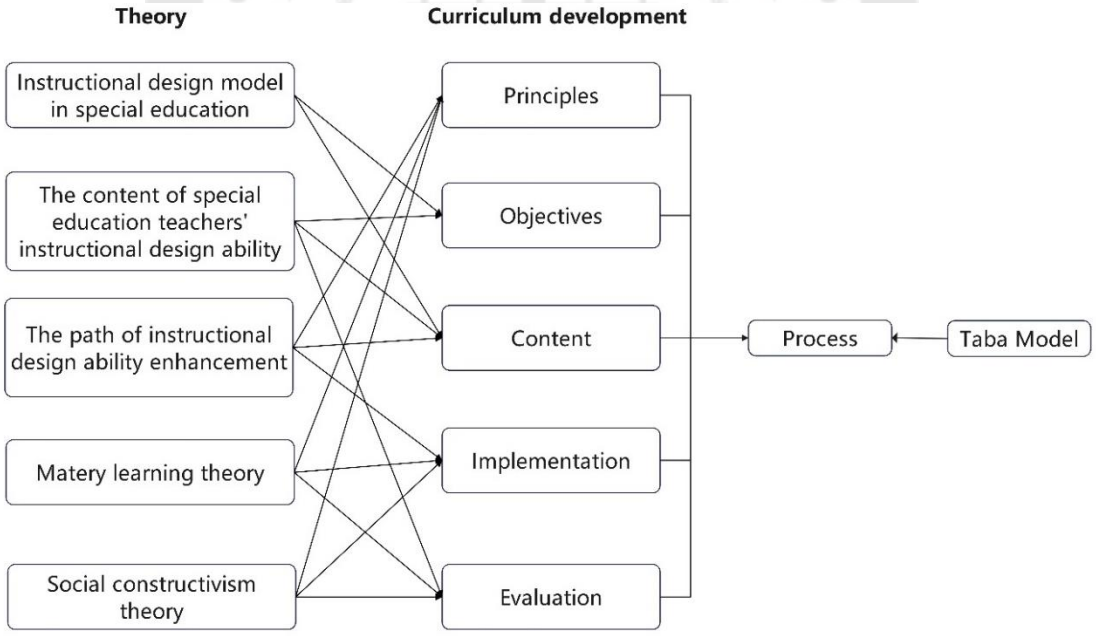


Figure 7 The specific application of relevant theory in curriculum development

The instructional design model in special education extensively addresses content and process of in special education. It involves curriculum objectives, and selecting and systematically organizing curriculum content. The content of special education teachers' instructional design ability outlines the ability requirements for teachers in this field, directly influencing curriculum objectives, curriculum content, and evaluation. The path of instructional design ability enhancement thoroughly analyzes the three critical learning stages and ability development dynamics, guiding curriculum principles, content organization and evaluation. Mastery learning theory focuses on instruction and assessment processes, while social constructivism theory stresses meaningful knowledge acquisition in authentic contexts, both of them affect the curriculum principles, implementation and evaluation. The Taba Model plays a crucial role in curriculum development, guiding the entire curriculum design process systematically and efficiently. based on these theories, the draft curriculum is developed:

2.1.1 Introduction

The curriculum of *Instructional Design in Special Education* served as a cornerstone for preservice special education teachers, offering a well-rounded curriculum that balanced theoretical insights with practical application. This course was designed to furnish learners with a comprehensive understanding of the knowledge underlying instructional design, alongside facilitating the practical application of these principles in the development of lesson plans. Engaging with the instructional design process, learners were prompted to recognize and appreciate the synergy among its various elements, thereby enhancing their logical thinking capabilities. Furthermore, this course aimed to instill a deep respect for life and empathy towards students with special needs, nurturing a humanitarian ethos among learners while shaping their professional ethos and value systems to align with the ideals of respect, care, and human dignity.

2.1.2 Curriculum principles

The curriculum system is constructed based on the instructional design procedure specific to special education.

Diversify learning opportunities

Emphasize the combination of theory and practice

2.1.3 Curriculum objectives

Enhance the instructional design ability of preservice special education teachers: analyze instructional content and learners, design instructional objectives, individualized instructional objectives, instructional strategies, instructional media, instructional process, and design rubrics to evaluate students' learning effects.

2.1.4 Curriculum structure

There were three stages in this curriculum and a total of 48 times, 45 minutes per time. The curriculum structure was shown as follows:

TABLE 13 The curriculum structure

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 & discussion 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	

TABLE 13 (Continued)

Module	Unit	Time	Topic	Teaching Method
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;

2.1.5 Learning activities

This curriculum was intricately designed to align with the path of instructional design ability enhancement, and organized into three instructional stages. in the knowledge translation stage, the curriculum prioritized the acquisition of theoretical knowledge through individual topic units. Application exercises were integrated to enhance students' comprehension of theoretical concepts, simultaneously fostering skill development through this comprehension process, thereby facilitating the translation of knowledge into practice.

During the skill aggregation stage, the focus transitions to collaborative learning, characterized by the creation, execution, and revision of teaching plans. Instructors fostered an environment of continuous dialogue and reflection among learners via innovative tasks, weaving the knowledge and skills acquired from individual units into a cohesive knowledge network. This approach was aimed at advancing the consolidation of skills. In the integration practice stage, educators guided the application of theoretical knowledge in new contexts by requiring learners from varied backgrounds to develop and implement teaching plans tailored to diverse learners, using different materials, and subsequently presenting these plans for evaluation. This stage emphasized the practical application of theoretical understanding, with instructors actively reviewing the teaching plans submitted. These three stages were shown as figure below:

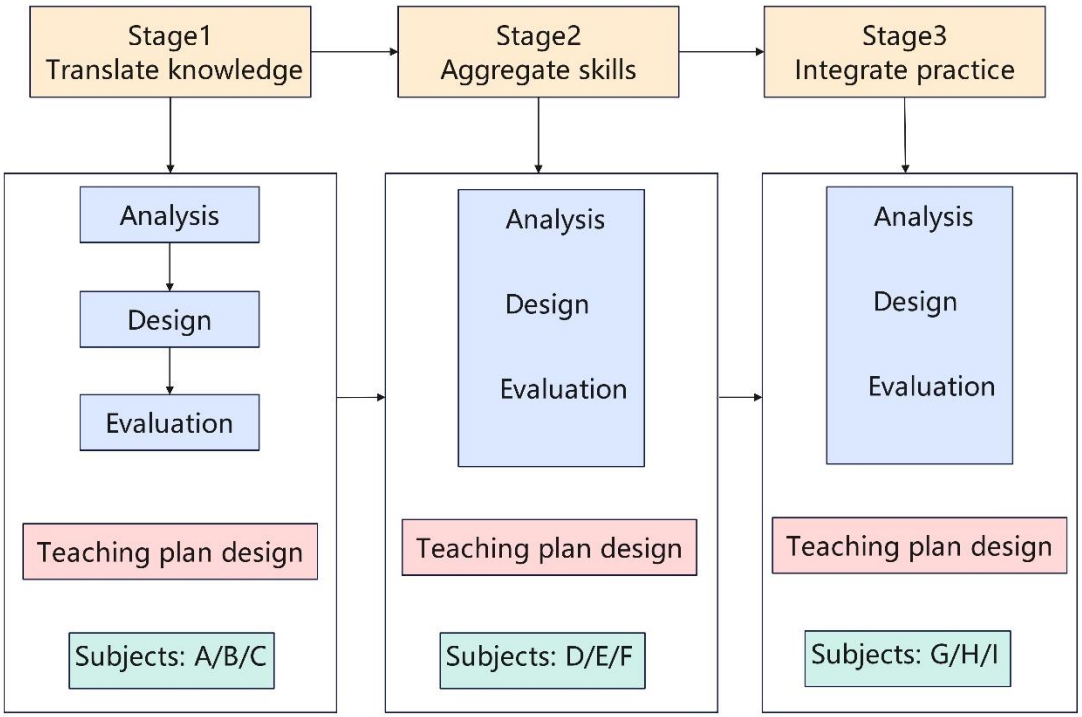


Figure 8 Learning stages

Throughout these stages, preservice special education teachers submitted their work via a QQ group for evaluation, receiving personalized feedback from instructors based on established criteria. Success in meeting these criteria resulted in a pass, while failure leaded to additional support. For those who pass, a wealth of materials was provided to further their knowledge. For those requiring additional support, instructors offered detailed feedback, demonstrations, multiple teaching opportunities, and a variety of resources for further study, including presentations, case studies, detailed evaluation criteria, online support through chat, direct one-on-one guidance, and facilitated group learning opportunities. Just as figure below:

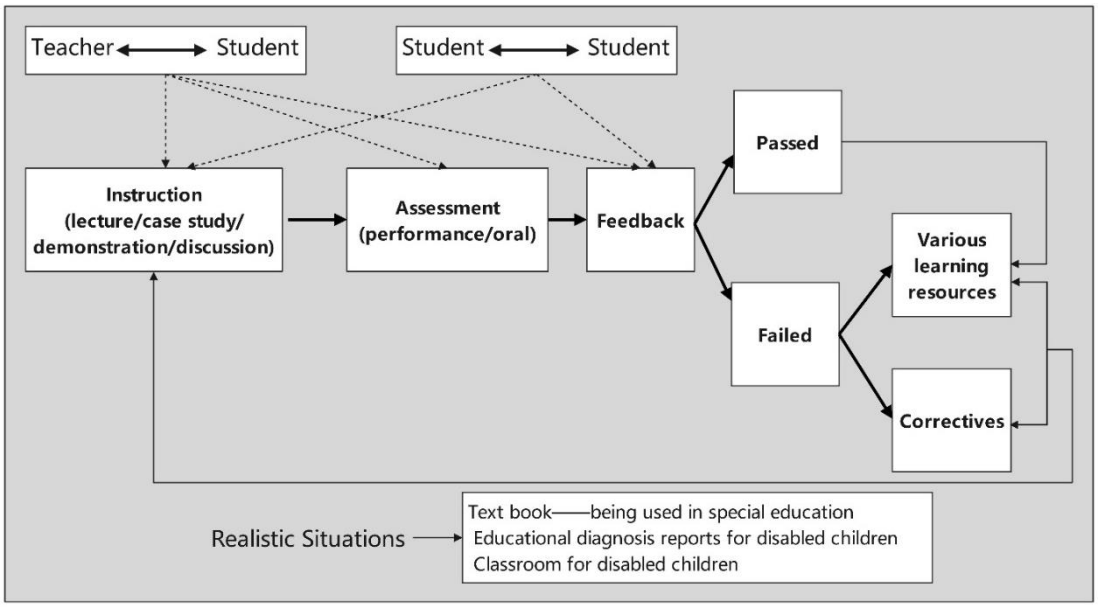


Figure 9 Learning activities in three stages

2.1.6 Curriculum materials & resources

The instructional media involved in this curriculum include: slides, literature, multimedia classrooms, education diagnosis reports for special children, at least 9 developmental disabilities, 9 small classrooms for special children, teaching observation for special children with a capacity of 55 people 1 classroom, textbooks for developmental disabilities (Life Chinese, Life mathematics, Life Adaptation).

2.1.7 Curriculum evaluation

The evaluation framework for this curriculum was structured around the instructional design process in special education. The Instructional Design Assessment Scale was employed within this curriculum to conduct a performance assessment of the effectiveness of the learning achievement.

2.2 Results of checking the quality of draft curriculum

The curriculum was checked for quality by specialists in curriculum development, instruction, assessment and evaluation, special education, and an expert special education teacher.

The mean scores for each item on the consistency assessment form ranged from 0.8 to 1.00 (as detailed in the Appendix D), consistently surpassing 0.5, thereby indicating a high level of consistency for all items within the draft curriculum. Each item was found to be in alignment with the curriculum's essential elements.

On the contrary, the mean scores for each item evaluated on the appropriateness assessment form spanned from 4.4 to 5.00 (as detailed in the Appendix D), with all scores surpassing the benchmark of 3.5. This consistently high range underscored the excellent appropriateness of every item within the draft curriculum, thereby indicating that each item is aptly aligned with the curriculum's essential elements.

The researcher revised the draft curriculum based on the recommendations from experts, the details were shown as below:

TABLE 14 Recommendations and revisions of the curriculum

Recommendations	Curriculum revisions
Curriculum objectives should be more concrete and be presented as a combination of overall objectives and subobjectives.	Refined and specified the curriculum objectives then presented them as overall objectives and subobjectives.
Adjusted the narrative style of the curriculum principles to make it more directive.	From the perspective of curriculum utilization, the curriculum principles were revised to progressively facilitate deep learning among students, emphasize the cultivation of logical thinking skills, and integrate life education.
Clarified the positioning and scope of the instruction design within this curriculum.	The researcher stated detailed explanation of the instructional design in the curriculum which was based on the subject courses and textbooks system of the national curriculum scheme. It specifically focused on organizing the curriculum content around the elements of instructional design for teaching single-lesson classes of children with developmental disabilities in special education schools.

TABLE 14 (Continued)

Recommendations	Curriculum revisions
Curriculum design thinking should correspond to its elements.	The curriculum design philosophy was articulated based on the elements of the curriculum (objectives, content, and evaluation).
The curriculum evaluation lacked diversity, therefore it was recommended to incorporate a broader range of approaches.	In the curriculum evaluation section, emphasis was placed on performance assessments as the main method of evaluation for this curriculum, supplemented by diagnostic evaluation, formative evaluation, and summative evaluation; including self-assessment and peer assessment.

2.3 Results of draft curriculum pilot study

Through the pilot study, the researcher evaluated the quality of the draft curriculum and examined its feasibility prior to implementation. Additionally, the pilot study helped identify any issues encountered during the curriculum implementation.

After the pilot study, the researcher found that, in the draft curriculum, the curriculum guidelines, lesson plans and evaluation forms were appropriate, but the instructional method should be adjusted: in the instructional activities, there were not only explanations, but also demonstrations should be added. In order to reinforce the theoretical knowledge learned in the first stage, it was recommended that a discussion be initiated following the completion of teaching in each module during the knowledge translation stage.

According to the results of pilot study, the researcher revised the draft curriculum, the details were shown as below:

TABLE 15 Recommendations and revisions of the curriculum

Recommendations	Curriculum revisions
Instructional method should be adjusted	Incorporated illustrative demonstrations into the instructional method.
It was recommended that a discussion be initiated following the completion of teaching in each module during the knowledge translation stage.	A discussion was incorporated after the completion of teaching in each module within the knowledge translation stage.

3. Results of curriculum implementation

3.1 The learning achievements in three stages

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

TABLE 16 The learning achievements in three stages

Assessment	Evaluation content	Total score	Mean score of learners	Percentage (%)
O-pre	Teaching plan 1	180	64.5	35.83
O1	Unit 1: Instructional content analysis	45	32.39	74.20
O2	Unit 2: Analysis of learners with special need	25	21.39	85.56
O3	Unit 3: Instructional objective design	20	16.09	80.45
O4	Unit 4: Individual instructional objective design for learner with special need	15	11.70	78.00
O5	Unit 5: Instructional strategy design for learner with special need	40	30.06	75.15

TABLE 16 (Continued)

Assessment	Evaluation content	Total score	Mean score of learners	Percentage (%)
O6	Unit 6: Instructional media design for learner with special need	10	6.85	68.50
O7	Unit 7: Instructional process design for learner with special need	15	11.88	79.20
O8	Unit 8: Instructional evaluation design for learner with special need	15	6.30	42.00
O9	Teaching plan 2	180	139.72	77.62
O10	Teaching plan 3	180	153.28	85.16
O11	Teaching plan 4	180	158.00	87.78
O12	Teaching plan 5	180	160.84	89.36
O13	Teaching plan 6	180	163.34	90.74
O-post	Teaching plan 7	180	165.34	91.86

From the table above, it was evident that learners achieved a score percentage of 35.83 before the curriculum implementation, which was significantly below 60.00. During the initial stage of the curriculum, learners developed a basic understanding of knowledge in most units, although there was considerable variation in mastery across these units, with average score percentages ranging from 42.00 to 85.56. As learners advanced through the second and third stages of the curriculum, their scores continued to improve, rising from 77.72% to 91.86%. This table revealed the substantial impact of the curriculum, specifically indicating a significant improvement in instructional design abilities among preservice special education teachers over the study period.

3.2 Mean scores of pretest and posttest

The researcher analyzed the data from both pretest and posttest assessments. The results were presented below:

TABLE 17 Mean scores of pretest and posttest

		Mean	n	Std. Deviation	Std. Error Mean
Pair 1	pretest	64.50	32	7.907	1.398
	posttest	165.34	32	10.706	1.893

According to Table 17, there were significant differences between the pretest and posttest sample means of the curriculum (64.50 and 165.34, respectively), with the posttest mean being higher than the pretest mean.

The correlation was shown below:

TABLE 18 The correlation coefficient between the pretest and posttest

		n	Correlation	P-Value
Pair 1	pretest & posttest	32	.346	.053

In the third column in table, the correlation coefficient between the pretest and posttest samples was 0.346, which indicated a significant improvement in learners' instructional design ability following curriculum implementation.

Furthermore, the researcher conducted an analysis of the p-value between the pretest and posttest.

TABLE 19 The p-value analysis between the pretest and posttest

	n	Mean	Std. Deviation	t	df	P-Value
Pretest-posttest	32	100.844	10.890	52.385	31	.000

As depicted in the table, there was a noteworthy improvement of 100.844 in the average instructional design ability score of learners subsequent to the curriculum intervention (SD = 10.890, df = 31, p-value = .000). The curriculum was demonstrably effective in significantly improving the instructional design ability of preservice special education teachers.

3.3 Results of learners' interview results after the implementation of the curriculum

Following the implementation of the curriculum, the researchers randomly selected three learners to participate in semi-structured interviews.

3.3.1Gains from the curriculum

After the study of the curriculum, learners could pay attention to the textbook, analyze the textbook, think about the content of teaching based on the given textbook, and design complete teaching plans by integrating the learners' conditions, setting instructional goals, individualized objectives, and teaching processes.

Now, I will carefully consider the content of the textbooks, analyze the information they provide, and determine what can be selected from them to effectively teach students. This will enable me to design appropriate and individual teaching objectives (Learner Y).

I can design the teaching based on the provided textbook (Learner X).

I am able to develop comprehensive lesson plans for special education, which differ from those designed for general education. Additionally, when developing lesson plans, I consider what content to teach, how to deliver instruction effectively, and how to cater to the individual learning needs of each student (Learner Z).

During the skill aggregation stage, each group implemented instructional design in classrooms for children with special needs. This process not only deepened learners' understanding of instructional design but also enabled them to gain valuable classroom teaching experience and strengthened their professional identity.

In practice, I receive timely feedback after each group teaching, which allows me to learn and accumulate a significant amount of teaching experience. These experiences have truly deepened my understanding and commitment to teaching special students. Despite encountering minor incidents along the way, they have only served to further motivate my pursuit of special education and my dedication to the classroom (Learner Z).

3.3.2 The most impressive part of the curriculum

The content of each section in the instructional design process formed the main part of this curriculum. By using the theoretical knowledge from each section, instructional design was completed and implemented in real classrooms, which benefited learners in considering and reflecting on instructional design. The interviewees also mentioned that completing instructional design this semester and implementing it in the classroom left them with a profound impression.

The procedure of developing teaching plans (Learner Z).

Understanding developmental children thoroughly before designing instruction is essential for successful implementation (Learner X).

On-site teaching. For the first time, I felt that my class was completely different from what I had envisioned. I realized that many of the well-designed activities couldn't be carried out as planned, so I had to make some changes. In this process, I had a strong sense of progress (Learner Y).

3.3.3 Suggestions for curriculum modifications

Usually, learners often tended to imitate the cases shown by instructors without engaging in deep thinking about the theoretical knowledge they were learning, when the cases presented by instructors to explain theories were too similar to the exercise cases. As a result, the interviewees recommended that during the knowledge

transformation stage of teaching, instructors should minimize the similarity between the cases presented and the exercise cases.

My senior sister's case is very similar to what I'm going to write, so I won't think much about it (Learner Y).

It is recommended that teachers minimize the similarity between the cases utilized in class and the exercise content, encourage independent thinking, and possibly refrain from providing cases in the initial stage (Learner X).

Collaborative learning enabled learners to complement each other's strengths and leverage the power of teamwork to enhance learning efficiency. However, when the division of labor within a group was not reasonable, such as when each group member only completed a part of the instructional design or only participated in one instance of instructional design and implementation, it could negatively impact the effectiveness of collaborative learning. Therefore, the interviewees suggested that instructors strengthened supervision during the second and third stages of group collaboration, so that each learner could benefit more from group work.

To ensure that each member receives adequate practice, it would be beneficial for the instructor to oversee the division within each group (Learner Z).

4. Results of Curriculum Evaluation and Curriculum Improvement

4.1 Results of curriculum effectiveness

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

4.2 Results of curriculum improvement

Based on the outcomes of curriculum implementation, the researcher revised the draft curriculum as detailed below:

TABLE 20 Recommendations and revisions of the curriculum

Recommendations	Curriculum revisions
Within knowledge translation stage, compared to cases used for learners' actual practice, different cases should be demonstrated.	The cases addressed in the knowledge translation stage were replaced with those differing from the exercise’s scenarios.
The teacher should provide a comprehensive explanation of the objectives, methodologies, and safety measures associated with group collaboration during the second and third stages. Additionally, the teacher should consistently monitor and oversee the collaborative processes within each group to optimize the efficacy of cooperative learning.	During the stages of knowledge translation and integration, the instructor issued a comprehensive set of guidelines for group collaboration, accompanied by in-depth explanations. To ensure effective cooperation across all groups, the instructor intensified oversight throughout each group's collaboration process.

CHAPTER 5
CONCLUSION AND DISCUSSION

This research embodied the characteristics of curriculum development and employed a mixed-methods approach, specifically an exploratory design. It utilized a two-phase sequential research plan, beginning with qualitative research methods and followed by continuous use of quantitative research methods. The research objectives, methodology, results, discussions, and recommendations were summarized as follows.

Summary of the Research

1. Objectives

The objectives of this research were to develop a curriculum focused on enhancing the instructional design ability of preservice special education teachers. The specific objectives were as follows:

To develop a curriculum focused on enhancing the instructional design ability of preservice special education teachers.

To evaluate the effectiveness of the developed curriculum.

2. Methodology

The development was divided into two cycles and four stages:

Stage 1: basic information study

This process involved 3 steps:

Step 1: Collect and analyze data from documents, concepts, theories, and related research concerning preservice teachers and focus on "instructional design", "instructional design ability", "instructional design competence", "instructional design competency" and "ability". The researcher examined instructional design and instructional design ability, strategies for improving instructional design ability, and methods for evaluating instructional design ability based on these literatures.

Step 2: With the semi structured interview protocols, the researcher interviewed teaching supervisors of special education schools that primarily

served children with developmental disabled children, expert special education teachers, and preservice special education teachers.

Step 3: The researcher analyzed the requirements, content, and evaluation criteria outlined in the-issued documents for preservice special education teachers.

Stage 2: Curriculum development

In this stage, based on the basic information analysis, the researcher developed a draft curriculum to enhancing the instructional design ability of preservice special education teachers, check ed the consistency and appropriateness of it, conducted a pilot study and made some improvements of the curriculum.

Stage 3: Implement the curriculum

The researchers utilized multi-stage sampling to select a sample of preservice special education teachers from Chongqing Normal University who were in their third year of university (N=32, male=3, female=29) as a single group, and totally 48 class periods (36 hours) in this curriculum.

Stage 4: Evaluate the curriculum

Before, during, and after the curriculum implementation, the researcher conducted performance assessments of learners' performance and analyzed changes due to their scores. Evaluation criteria were used to evaluate the effectiveness of the curriculum, and improvements were made as a result of the evaluations.

3. Results

3.1 Results of stage 1

3.1.1 Results of literature analysis

Special education instructional design was tailored to the physical and mental characteristics 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.

3.1.2 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. Moreover, the teachers struggled with designing comprehensive teaching plans essential for developmental special education. To address these issues, it was 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 was recommended.

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.

3.1.3 Results of content analysis

Currently, the policy documents provided a detailed description of the instructional design ability of special education teachers. Currently, national policy documents required special education teachers to possess instructional design ability, 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.

3.2 Results of stage 2

3.2.1 Results of the draft curriculum

The draft curriculum consisted of three stages, each comprising 48 sessions of 45 minutes each. It included five main components: principles, objectives,

curriculum content, learning activities, and evaluation. The learning activities included three stages:

Stage 1: knowledge translation: Overview of Instructional design in special education, analysis and instructional content and learners, design of objectives, individual objectives, strategy, process, instructional media, and evaluation.

Stage2: skill aggregation: Comprehensive practice across all topics

Stage3: practice integration Integrated practice across all topics

3.2.2 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 improved the draft curriculum, focusing on key areas such as clarifying curriculum principles, specifying objectives, and enhancing evaluation diversity.

3.2.3 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.

3.3. Result of stage 3

3.3.1 The learning achievements in three stages

Based on the quantitative analysis, a clear trend emerged: there was a consistent and progressive increase in the sample mean from Stage 1 to Stage 3. This pattern not only highlighted the statistical significance but also emphasizes the substantial impact of the curriculum intervention. Specifically, it indicated a significant improvement in instructional design abilities 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. 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 instructional design ability score of learners after the curriculum intervention (SD = 10.890, df = 31, p-value = .000). The curriculum could significantly enhance the instructional design ability of preservice special education teachers with a significance level of .05.

3.4 Results of stage 4

3.4.1 Results of curriculum evaluation

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

3.4.2 Results of curriculum improvement

Based on the findings from the curriculum implementation, the researcher made improvements to the draft curriculum, including: replacing the cases addressed in the knowledge translation stage with scenarios distinct from the exercise scenarios; providing comprehensive guidelines for group collaboration during the knowledge translation and integration stages, along with in-depth explanations; and intensifying instructor oversight throughout each group's collaboration process to ensure effective cooperation.

Conclusion

1. Conclusion on designing and developing the curriculum of Instructional design in Special Education

The curriculum of instructional design in special education included the nature, principles, curriculum design rationale, objectives, content, curriculum implementation stages, learning activities in the curriculum, the arrangements of the

curriculum, curriculum materials, and evaluations. The main components were shown as table below.

TABLE 21 The main components of the final version of the curriculum

Domains	Content
Curriculum principles	- Gradually promoting deep learning in students. - Emphasis on developing logical thinking skills - Integrating life education
Curriculum content	- An overview of special education instructional design - The process of special education instructional design: Analysis: instructional content analysis and analysis of learner with special needs. Design: design of instructional objectives, individual instructional objectives, instructional strategies, instructional media, and instructional process for learners with special needs. Evaluation: evaluation design for learners with special needs.
Curriculum implementation	- Learning stages: knowledge translation, skill aggregation and practice integration. - Learning activities: instruction (lecture, case study, demonstration and discussion) ⟶ assessment ⟶ feedback. - The arrangements of the curriculum: this curriculum has a total of 48 class periods and is divided into 24 times, each time 2 class periods, 45 minutes per class period.
Curriculum materials	Lecture notes and written materials, slides, a multimedia classroom, 3 diagnostic reports for special needs children, five exemplary lesson plans for children with developmental disorders, five high-quality teaching videos for children with developmental disorders, at least nine special needs children, nine small classrooms for special needs children, one observation classroom for special needs education with a capacity of 55, instructional design ability assessment scale, and special needs children's textbooks (Life Chinese, Life Mathematics, Life Adaptation).
Evaluation in the Curriculum	- Performance assessment as the primary evaluation method - Combination of diagnostic, formative, and summative assessments - Combination of self-assessment and peer assessment

2. Conclusion of curriculum evaluation

Through the implementation of the curriculum, significant results have been achieved. The curriculum was designed to emphasize the instructional design ability. During the learning stages, according to the data, it could be found that, before the curriculum, the learners had an average score ratio of 35.83, significantly below 60.00. During three stages of learning in this curriculum, the average score ratio of learners increased from 42.00 to 91.86.

The pretest and posttest sample mean for the curriculum were 64.50 and 165.34, respectively. The posttest mean exceeded the pretest mean, indicating a substantial increase in instructional design ability scores following curriculum implementation. An analysis of the p-value between the pretest and posttest showed a significant improvement of 100.844 in the average instructional design ability score of learners after the curriculum intervention (SD = 10.890, df = 31, p-value = .000). This improvement was statistically significant at the .05 level, demonstrating that all preservice special education teachers experienced notable enhancement in their instructional design abilities compared to their pre-curriculum levels. Additionally, preservice special education teachers expressed high satisfaction with the curriculum.

Discussions

1. The results of the curriculum development for Instructional Design in Special Education

This research followed a systematic curriculum research and development process encompassing four stages: basic information research, curriculum development (drafting, quality checking, pilot study), curriculum implementation, and curriculum evaluation. These stages included diagnosing needs, formulating objectives, selecting and organizing learning experiences, and evaluating achievements, aligning with Taba's curriculum development model (Taba, 1962).

In the curriculum development of this research, a needs analysis was conducted to identify the gap between learners' expects and actual states. This analysis aimed to pinpoint learning issues, gain a deeper understanding of the learners, and

provide a foundation for curriculum planning, design, materials, and evaluation (Taba, 1962; Richards, 2017; West, 1994). The method used for the needs diagnosis aligned with Chen's (2010) needs analysis model. The needs diagnosis revealed that relevant policy documents and teaching requirements for special education in mainland China expected preservice special education teachers to complete instructional design based on textbooks and curriculum standards. However, currently, these preservice special education teachers could only follow templates without understanding the internal logic of the instructional design components, as noted by Rusznyak & Walton (2011). Proficiency in any field depended on a robust knowledge base applicable to problem-solving (Leko et al., 2012), but these preservice special education teachers lacked the necessary knowledge and skills for instructional design. This finding was consistent with those of Beyer & Davis (2012), Grossman & Thompson (2008), Li (2013), and Valencia et al. (2006).

Based on the needs diagnosis results, the curriculum objectives were established: to enable teachers to complete instructional designs according to the special education instructional design process. This included analyzing instructional content and the needs of learners with special needs, and designing instructional objectives, individualized instructional objectives, instructional strategies, instructional media, the instructional process, and evaluation for them. The design approach of the curriculum objectives in this study was based on the instructional design process, as discussed in the research on cultivating preservice teachers' instructional design abilities by Du (2011), Jia (2008), Liao (2022), Liu et al. (2012), Luo (2012), Pang & Li (2010), and Zhang et al. (2004).

In selecting the curriculum content, the researcher reviewed textbooks and journal articles on instructional design, and analyzed the concepts of instructional design and instructional design competency, as well as the similarities and differences between typical and special needs children. This analysis led to the identification of the basic structure of the instructional design process in teaching practice, defining special education instructional design into three modules: analysis (instructional content

analysis, special needs learner analysis), design (instructional objectives design, individualized instructional objectives design for special needs learners, instructional strategies design for special needs learners, instructional media design for special needs learners, instructional process design for special needs learners), and evaluation (evaluation of instructional design for special needs learners). The curriculum in this research encompassed the concepts and fundamental content of each component of special education instructional design. It also included the application of theoretical knowledge from each component, requiring learners to explore theoretical knowledge through practical exercises. These exercises helped learners understand the complete significance of theoretical knowledge, transform it into personal experience, and gradually enhance their breadth of knowledge. The selection of curriculum content in this study adhered to the principles of Taba's curriculum development theory (Taba, 1962; Taba, 1965; Taba, 1967; Zhong, 2022), aligned with the theory proposed by Gordon et al. (2019), and was supported by the findings of Xu & Qu (2011) and Ma & Sheng (2016). It also met the requirements for special education instructional design as mentioned by Qian & Zou (2009).

In organizing the curriculum content, this research followed the logical structure of the discipline of special education instructional design, dividing the content into two core sections: an overview of special education instructional design and the instructional design process. Within the organization of the instructional design process content, this research structured the curriculum into three stages based on the path of competency development: knowledge translation, skill aggregation, and practice integration. Each stage corresponded to the surface, deep, and transfer phases of learning. This organization of curriculum content aligned with the three-phase learning model proposed by Frey et al. (2018). However, the process of instructional design was a complex cognitive process (Koehler et al., 2018), which could be particularly challenging for preservice teachers (Zhang et al., 2017). Due to the complexities of teaching children with disabilities, exposure to diverse educational needs could increase stress for preservice special education teachers (Forlin & Chambers, 2011;

Hemming & Woodcock, 2011). Therefore, this research focused on progressively organizing the curriculum content, integrating the instructional design process of special education with the pedagogical content knowledge for children with developmental disabilities. The curriculum also balanced key points and details while providing diverse learning activities to promote learners' self-development.

According to this, it was seen that this research emphasized in organizing curriculum content: ensuring alignment with the design of special education for children, balancing societal needs with individual learner requirements, integrating breadth and depth considerations, integrating content from other courses, sequencing content logically according to knowledge and learning patterns, maintaining continuity, and ensuring each knowledge module achieved practical application to enhance transferability, aligning with the theories proposed by Gordon et al. (2019).

In the curriculum implementation stage, the instructor integrated practical highlights into classroom instruction through explanations, case presentations, and discussions, providing clear guidance. Learners were required to complete practical exercises using textbooks designed for children with developmental disabilities. The instructor provided feedback based on specific assessment criteria; those who met the standards received additional learning materials for further study, while those who did not were encouraged to revise their work using resources from the learning group, review their notes, and discuss with the teacher until they met the criteria. For learners who did not achieve the expected learning outcomes, the researchers provided online learning resources and personalized feedback to help them successfully master the knowledge. Upon completion of each unit, learners proceeded to the next unit until they completed the entire stage. The instructor assessed the learning outcomes at each stage to determine whether learners could progress to the next stage. This design of learning activities aligned with the mastery learning instructional processes discussed by Dai (2018), Guskey (2007), Jing (1999), Qiao & Li (2018), and Zhang (2009). Throughout the curriculum implementation, the instructor provided individualized guidance based on the diverse characteristics of learners, thereby promoting the

development of their instructional design abilities. This approach was consistent with the requirements outlined by Chubbuck et al. (2001), and Stein & D'Amico (2002).

During the three stages of learning, the instructor organized numerous discussions aimed at facilitating interaction and dialogue between learners and the instructor, as well as among the learners themselves. This design encouraged learning through interaction, allowing learners to engage with learning tasks, formulate and share their ideas, and thereby enhance their understanding of the knowledge. This approach was consistent with the findings of Luo (2012), Song (2022), and Wu & Reeves (2014). Additionally, the instructor created authentic contexts throughout the three stages of learning by using textbooks from special education schools, diagnosis reports of exceptional children, and requiring learners to implement their completed instructional designs in actual classrooms with exceptional children. This approach helped learners comprehend the theoretical knowledge of instructional design in real-world settings and enhanced learning outcomes in natural contexts, as highlighted by Brown et al. (1989), Song (2022), and Wang (2018). Providing timely feedback met the needs of learners with different styles, this design followed the principles of the three stages of learning (Frey et al., 2018), aligned with the path of competency development, and adhered to the principles of mastery learning (Bloom, 1968) and social constructivism (Leeds-Hurwitz, 2009; Roth, 2000; Vygotsky, 1978).

This curriculum employed performance-based assessment, focusing on detailed scoring of various content components of learners' lesson plans at different stages of the curriculum implementation. In the knowledge translation stage, assessment was primarily conducted by the instructor. A combination of instructor and peer evaluations took place in the second and third stages, with learners evaluating both the work of their own groups and the work of other groups. The curriculum evaluation in this research encompassed diagnostic, formative, and summative assessments, as noted by Jing (1999). This comprehensive evaluation design integrated diagnostic, formative, summative, self, and peer assessments, encouraging learners to continuously reflect on theoretical knowledge, thereby enhancing their understanding

and application skills. The instructor analyzed learners' scores to gauge their learning progress and provide targeted guidance for subsequent learning. This evaluation design facilitated understanding learners' mastery of knowledge, aligning with the requirements highlighted by Yang & Liu (2007) and Dai (2018).

2. The instructional design ability of preservice special education teachers was improved all before, during, and after the curriculum

Throughout the curriculum, the researcher conducted a total of 15 assessments, spanning pre-curriculum, in-curriculum, and post-curriculum stages. During the initial stage of learning, learners demonstrated a strong grasp of individual knowledge modules. The instructional content analysis involved interpreting subject area knowledge, curriculum standards, and practical teaching experience (Wu et al., 2022). Deficiencies in these areas among preservice teachers led to challenges in analyzing instructional content and planning teaching activities (Zhang et al., 2017). Consequently, the performance of these learners in the unit of instructional content analysis and the design of instructional strategies for special needs learners was slightly lower compared to other knowledge areas. The performance of this group of preservice special education teachers notably decreased in the tenth assessment compared to subsequent assessments. This could be attributed to the complexity of knowledge in special education instructional design (Stepich et al., 2001) and their lack of in-depth understanding of subject matter and children (Ball & Feiman-Nemser, 1988). This assessment evaluated their overall knowledge acquisition and application, representing their first attempt at conceptual organization, which posed difficulty for them. Overall, the results of the 15 assessments indicated continuous improvement among these learners. Analysis of the entire curriculum revealed that it adhered to key features of an effective special education teacher preparation program, including pedagogies that promote active learning and coursework aligned with high-quality field experiences.

2.1 The pedagogies employed in this research to promote active learning:

Case-based instruction. In the first stage of the curriculum, the instructor provided three assessment reports of exceptional children, requiring learners to apply theoretical knowledge to complete design teaching plans for the three individuals. In the

second and third stages, learners were required to implement their completed teaching plans in real classrooms. Individual cases of exceptional children permeated the entire curriculum learning process. Through case-based teaching, this research prompted learners to shift their focus from acquiring explicit knowledge and skills that constitute traditional academic courses towards actively developing knowledge, enabling learners not only to recall theoretical knowledge of instructional design but also to apply it to problem-solving. This finding aligned with the results of Stepich et al. (2001). The cases used in this curriculum represented the complexity and ambiguity inherent in real-world special needs education, aiding preservice special education teachers in bridging the gap between theoretical knowledge of instructional design and the intricate demands of practice, encouraging them to reflect on relevant theories when exploring design issues further, as noted by Julian et al. (2008).

Field experiences. The curriculum developed in this research consists of a total of 48 class periods. The first stage focused on the learning and practice of theoretical knowledge. The second and third stages involved practical experiences, totaling 16 class periods: learners completed instructional designs and implemented them in classrooms with special needs children, with experienced special education teachers providing on-site guidance, pointing out strengths and weaknesses in the instructional designs post-teaching. Leko et al. (2012) noted that high-quality field experiences offered preservice special education teachers opportunities to apply their knowledge in real teaching situations, thereby enhancing their understanding. From the assessment results, it was evident that learners' performance had been consistently improving. Furthermore, the instructor aimed to use field experiences to help future teachers adapt to the complexity and diversity of classrooms, thus enhancing their problem-solving abilities in instructional design, which aligned with the perspective of Billingsley & Scheuermann (2014).

2.2 The coursework aligned with high-quality field experiences.

In the first stage of the curriculum, the instructor required learners to complete instructional designs by integrating textbooks from special education schools

with assessment reports of exceptional children. In the second and third stages, learners were required to understand children with special needs and apply theoretical knowledge of instructional design for special needs children to create teaching activities for them. Each coursework was based on teaching in special education schools and received timely feedback from both the instructor and onsite supervising teachers. The data analysis indicated that this design, which combined coursework with high-quality field experience, enhanced the learning achievements of pre-service special education teachers' theoretical knowledge and encouraged them to apply their learning to identify and solve problems in practice. This result aligned with the findings of Leko et al. (2012).

3. The preservice special education teacher's instructional design abilities are higher after curriculum than before.

The average score of preservice special education teachers' instructional design ability before the curriculum was 64.50, and after the curriculum, it was 165.34 (out of a total score of 180). The P-value was .000. According to effectiveness criteria, this curriculum significantly enhanced the instructional design ability of preservice special education teachers. Possible reasons for this improvement include:

3.1 The curriculum content was organized rationally.

The development of instructional design abilities followed a progressive and spiral process (Wang, 2004). Preservice teachers' instructional design abilities evolved from non-existent to existent, and from lower to higher stages (Liao, 2022). During the knowledge translation stage, learners primarily focused on absorbing theoretical knowledge, gradually deepening their understanding through thematic modular application exercises, which in turn fostered the development of corresponding skills. In the skill aggregation stage, learners employed comprehensive knowledge modules to collaboratively design, implement, and revise lesson plans. During the practice integration stage, learners designed and implemented lessons using a variety of materials in new settings based on theories they had learned. This content organization in the curriculum aligned with the developmental trajectory of pre-service special education teachers' instructional design ability (Liao, 2022): memory and

understanding → application and analysis → evaluation and reflection → innovation and creation.

3.2 This curriculum integrated practical application at each stage of instruction.

During the knowledge translation stage, theoretical knowledge was explained by the instructor and combined with on-site practical discussions. After the theoretical explanations, learners engaged in on-site discussions of their coursework. They were required to complete practical tasks using textbooks and considering the needs of children with special needs. In the skill aggregation stage, learners were required to use theoretical knowledge to design instruction for children with special needs. After implementation, learners analyzed and discussed the validity of their work in class, using theoretical knowledge as a reference. In the practice integration stage, learners were required to apply theoretical knowledge to design instruction for children with special needs in new settings. After implementation, they again analyzed and discussed the validity of their work using theoretical knowledge. The close integration of theoretical learning and practical application helped learners master theoretical knowledge and develop practical skills, consistent with the findings of Cohn et al. (1987).

3.3 The power of feedback

In this research, the instructor provided timely feedback to learners about their coursework, clearly identified issues with their current coursework, and offered suggestions for improvement. The purpose was to provide guidance to facilitate learners' self-correction. Additionally, the instructor offered different types of support based on the learners' individual performance, including providing specific case studies for discussion, one-on-one online guidance, and on-site demonstrations. This approach helped learners to hear or see, understand, and apply the feedback, thereby aiding their progress. Data analysis results indicated that feedback on relevant tasks and how to complete them more effectively led to significant learning outcomes. This finding aligned with the research of Hattie & Timperley (2007) and Mandouit & Hattie (2022).

Recommendations

1. Recommendations for curriculum usage

The primary objective of this curriculum was to facilitate the comprehension of theoretical knowledge of instructional design in special education, apply this knowledge in practice, and integrate it into the learners' psychological framework. This process also served as a learning task for novice stage teachers to foster their professional growth and expand their knowledge and abilities. Consequently, this curriculum was designed for both novice special education teachers and preservice special education teachers.

The curriculum comprised 48 class periods, divided into 8 units and three learning stages. All preservice special education teachers demonstrated significant improvement in their instructional design abilities, and they expressed high satisfaction with the curriculum. Utilizing case-based instruction and field experiences, learners engaged in active learning. The coursework aligned with high-quality field experiences, organized curriculum content rationally, integrated practical application at each stage of instruction, and utilized feedback effectively to achieve learning outcomes for the learners.

To enhance the training effectiveness of this curriculum, users should adhere to the following principles:

1)Teaching should adhere to the principles of knowledge acquisition.

Users should guide learners through a step-by-step sequence of teaching activities, starting from easy tasks and gradually progressing to more complex ones. This approach enabled continuous feedback to learners, enhancing their learning abilities, stimulating questions, and fostering ongoing learning.

2) Multiple assessment methods should be used.

To assess learners' progress, including observation, oral evaluation, exercises, and homework records, etc. Users should observe learners' learning progress, assess their understanding, correct any misunderstandings, and provide additional instruction for challenging or complex readings.

3) Users should develop a variety of learning materials to supplement learners' reading at each stage and broaden their knowledge perspectives.

2. Recommendations for future research

This curriculum is mainly implemented with third-year students from the Department of Special Education at Chongqing Normal University as the sample. However, in China, the undergraduate programs for the same major varies among different universities, thus learners have different professional foundations. There are variations in learners' prior knowledge and experience in studying this curriculum. This curriculum should be implemented and revised multiple times in more universities.

Teachers at different professional developing stages have different knowledge tasks. This curriculum primarily targets novice special education teachers. In the future, it would be necessary to develop curriculums that support the professional growth of teachers at the competency, proficiency, and expertise stages.

REFERENCES

Ackerman, P. L. (1996). A theory of adult intellectual development: process, personality, interests, and knowledge. *Intelligence*, *22*(2), 227-257. https://doi.org/10.1016/s0160-2896(96)90016-1

Adams, P. (2006). Demystifying constructivism: the role for the teacher in new-technology exploiting learning situations. In *L. Tan Wee Hin & R. Subramaniam (Eds) Handbook of Research in Technology at the K–12 level* (p. 493–514). Hershey, Idea Group.

Alvior, M. G. (2014, December 13). *The meaning and importance of curriculum development*. https://simplyeducate.me/2014/12/13/the -meaning -and -importance-of-curriculum-development/.

Amineh, R. J., & Asl, H. D. (2015). Review of constructivism and social constructivism. *Journal of Social Sciences, Literature and Languages*, *1*(1), 9-16.

An, F. F. (2003). Social constructivist evaluation. *Teaching and Research*, (4), 63-67.

An, W. F. (2005). Social constructivism: The End of Postmodern Theory of Knowledge. *Philosophical Studies*, (5), 60-67.

ARI, İ. A., & Baş er, D. (2022). Evaluation of preservice teachers' computer-based instructional materials by special education teachers. *Ahmet Keleş oğ lu Eğ itim Fakültesi Dergisi*, *4*(2), 248-266. https://doi.org/10.38151/akef.2022.16

Assessment Reform Group. (1999). *Assessment for learning: beyond the black box*. Cambridge School of Education.

Ball, D. L., & Feiman-Nemser, S. (1988). Using textbooks and teachers' guides: a dilemma for beginning teachers and teacher educators. *Curriculum Inquiry*, *18*(4), 401. https://doi.org/10.2307/1179386

Barrow, R., & Milburn, G. (1990). *A critical dictionary of educational concepts: An appraisal of selected ideas and issues in educational theory and practice*

(2nd ed.). New York: Teacher College Press.

Beyer, C. J., & Davis, E. A. (2012). Developing preservice elementary teachers' pedagogical design capacity for reform-based curriculum design. *Curriculum Inquiry*, *42*(3), 386-413. https://doi.org/10.1111/j.1467-873x.2012.00599.x

Bhuttah, T. M., Chen, X. D., Ullah, K., & Bibi, A. (2018). Curriculum development: "an analysis of the Tyler and Taba Model". *North American Academic Research*, *1*(7), 109-118.

Billingsley, G. M., & Scheuermann, B. K. (2014). Using virtual technology to enhance Field experiences for pre-service special education teachers. *Teacher Education and Special Education*, *37*(3), 255-272. https://doi.org/10.1177/0888406414530413

Bloom, B. S. (1968). Learning for mastery. *Evaluation Comment*, *2*(1), 1-11.

Bobbitt, F. (1918). *The curriculum*. Boston: Houghton Mifflin Company.

Brown, A. H., & Green, T. D. (2019). *The essentials of instructional design: Connecting fundamental principles with process and practice* (4th ed.). London: Routledge.

Brown, J., Collins, A., & Daguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, (1), 32-42.

Brown, P. C., III, H. L., & McDaniel, M. A. (2014). *Make it stick: the science of successful learning*. Cambridge: Belknap Press.

Bruner, J. S. (1963). Structures in learning. *Today's Education*, *52*(3), 26-27.

Bullough, R. V. (1992). Beginning teacher curriculum decision making, personal teaching metaphors, and teacher education. *Teaching and Teacher Education*, *8*(3), 239-252. https://doi.org/10.1016/0742-051x(92)90023-v

Campbell, D. T., & Stanley, J. (1963). *Experimental and quasi-experimental designs for research on teaching*. Boston: Houghton Mifflin.

Carroll, J. B. (1989). The Carroll model: a 25-Year retrospective and prospective view. *Educational Researcher*, *18*(1), 26. https://doi.org/10.2307/1176007

Caswell, H. L., & Campbell, D. S. (1935). *Curriculum development*. New York: American Book.

Chen, B. B. (2010). Theoretical construction of college English demand analysis model.

Foreign Language Research, (2), 120-123.

Chen, F. F. (2009). Analysis and review of foreign demand studies. *Teaching and Research of Foreign Languages*, *41*(2), 125-130.

Chen, W. (2013). An empirical study on the development of preservice English teachers' instructional design competency under the perspective of ecological teaching. *Distance Education in China*, (7), 60-63.

Chen, W. (2018). *Research on the Professional Development of Elementary Mathematics Teachers from the Perspective of TRACK* [Unpublished doctoral dissertation]. Nanjing Normal University, China.

Chen, X. H. (2009). *Instructional Design* (2nd ed.). Beijing: Publishing House of Electronics Industry.

Chen, Z. J. (2007). *Assessment for Exceptional Children*. Taipei: Psychological Press.

Cheng, E. C. (2014). Learning study: Nurturing the instructional design and teaching competency of pre-service teachers. *Asia-Pacific Journal of Teacher Education*, *42*(1), 51-66. https://doi.org/10.1080/1359866x.2013.869546

Chouhan, V. S., & Srivastava, S. (2014). Understanding Competencies and Competency Modeling — A Literature Survey. *Journal of Business and Management (IOSR-JBM)*, *16*(1), 14-22.

Chubbuck, S. M., Clift, R. T., Allard, J., & Quinlan, J. (2001). Playing it safe as a novice teacher. *Journal of Teacher Education*, *52*(5), 365-376. https://doi.org/10.1177/0022487101052005003

Cohn, M. M., Gellman, V., & Tom, A. R. (1987). The secondary professional semester. *Teaching Education*, *1*(2), 31-37.

Dai, J. H. (2018). *A study on the diagnosis and correction of students' errors in junior high school mathematics based on "mastery learning theory* [Unpublished master's thesis]. Shanghai Normal University, Shanghai, China.

Darling-Hammond, L. (2006). Constructing 21st-Century teacher education. *Journal of Teacher Education*, *57*(3), 300-314. https://doi.org/10.1177/0022487105285962

Doll, D. C. (1996). *Curriculum improvement: Decision making and process* (9th ed.).

Boston: Allyn & Bacon.

Dong, Y., & Hong, X. R. (2012). *Development Research on Instructional Design Abilities Testing Scale for Student Teachers*. In *New Horizons in Web Learning* (pp. 110-119). Springer Berlin Heidelberg.

Du, P. (2011). The Development and Reflection of Basic Teaching Competency Standards for Contemporary Elementary and Secondary School Teachers. *Curriculum, Teaching material and method*, *31*(8), 95-100.

Evans, A. L., Bulla, A. J., & Kieta, A. R. (2021). The precision teaching system: A synthesized definition, concept analysis, and process. *Behavior Analysis in Practice*, *14*(3), 559-576. https://doi.org/10.1007/s40617-020-00502-2

Everwijn, S. E., Bomers, G. B., & Knubben, J. A. (1993). Ability- or competence-based education: bridging the gap between knowledge acquisition and ability to apply. *Higher Education*, *25*, 425-438. https://doi.org/10.1007/BF01383845

Fadde, P. J. (2009). Instructional design for advanced learners: Training expert recognition skills. *Educational Technology Research and Development*, *57*(3), 359-377.

Fang, X., & Sheng, Q. L. (2015). A Summary of the New Standard of IBSTPI International Instructional Design Ability-- A Vision of the Professional Development of instructional designers. *Journal of distance Education*, *33*(3), 82-87.

Forlin, C., & Chambers, D. (2011). Teacher preparation for inclusive education: Increasing knowledge but raising concerns. *Asia-Pacific Journal of Teacher Education*, *39*(1), 17-32. https://doi.org/10.1080/1359866x.2010.540850

Forsling, K. (2019). Designs for learning: Focus on special needs. *Designs for Learning*, *11*(1), 108-117. https://doi.org/10.16993/dfl.106

Frey, N., Hattie, J., & Fisher, D. (2018). *Developing Assessment-Capable Visible Learners, Grades K-12: Maximizing Skill, Will, and Thrill (Corwin Literacy)* (1st ed.). California Thousand Oaks:Corwin.

Gagné, R. M. (1967). *Curriculum research and the promotion of learning. in AERA Monograph Series on Evaluation: Perspectives of Curriculum Evaluation， No. 1. p. 21*. Chicago: Rand McNally.

Gagné, R. M., Wager, W. W., Golas, K., & Keller, J. M. (2005). *Principles of instructional design* (5th ed.). Cengage Learning.

Gallacher, T., & Johnson, M. (2019). “Learning Progressions”: A historical and theoretical discussion. *Research Matters*, (28), 10-16.

Gao, Y. C., Gao, F., & Zhang, Y. S. (2021). Research on the teaching implementation ability of preservice teachers majoring in special education under the background of professional certification standards. *Jiao Yu Guan Cha*, *30*(10), 54-56.

Gay, G. (1990). Achieving educational equality through curriculum desegregation. *Phi Delta Kappan*, *72*(1), 61-62.

Goodlad, J. I. (1963). *Planning and organizing for teaching*. Washington: National Education Association.

Gordon, W. R., Taylor, R. T., & Oliva, P. F. (2019). *Developing the curriculum* (9th ed.). New York: Pearson.

Grossman, P., & Thompson, C. (2008). Learning from curriculum materials: Scaffolds for new teachers? *Teaching and Teacher Education*, *24*(8), 2014-2026. https://doi.org/10.1016/j.tate.2008.05.002

Gu, M. F. (2013). *A Study on the Composition of Teachers' Instructional Design Ability* [Unpublished master's thesis]. Hangzhou Normal University, Hangzhou, China.

Gu, M. Y. (1999). *Education Dictionary*. Shanghai: Shanghai Education Press.

Gu, M. Y. (2017). Ensuring every child has access to equitable and high-quality education. *Educational Research*, *454*(11), 4-7.

Guan, M., & Huang, Y. C. (2021). Connotation, Composition and Evaluation of Teachers' Instructional Design Ability. *Journal of Heilongjiang Institute of Teacher Development*, *40*(8), 20-23. 10. 3969 / j. issn. 2096-8531. 2021. 08. 007

Guskey, T. R. (2005). *Formative Classroom Assessment and Benjamin S* [Paper presentation]. Annual Meeting of the American Education Research Association/Bloom: Theory, Research, and Implications, Montreal, Canada.

Guskey, T. R. (2007). Closing achievement gaps: Revisiting Benjamin S. Bloom's “Learning for mastery”. *Journal of Advanced Academics*, *19*(1), 8-31.

https://doi.org/10.4219/jaa-2007-704

Halverson, P. M. (1961). *The meaning of balance. In (n.a.) Balance in the curriculum, 1961 yearbook*. Alexandria: Association for Supervision and Curriculum Development.

Han, M. (2020). Problems and Countermeasures in Educational Practice during the Pre-service Training Stage of Special Education Teachers. *The Science Education Article Collects*, *512*(32), 39-40.

Hardre, P. L., & Kollmann, S. (2013). Dynamics of instructional and perceptual factors in instructional design competence development. *Journal of Learning Design*, *6*(1), 46-60. https://doi.org/10.5204/jld.v6i1.106

Hattie, J., & Timperley, H. (2007). The Power of Feedback. *Review of Educational Research*, *77*(1), 81-112. DOI: 10.3102/003465430298487

He, K. K., Xie, Y. R., & Zheng, Y. B. (2002). *Instructional System Design* (1st ed.). Beijing: Beijing Normal University Press Group.

He, R. S. (2014). *Introduction to Instructional System Design*. Changsha: Hunan University Press.

Hemmings, B., & Woodcock, S. (2011). Preservice teachers' views of inclusive education: A content analysis. *Australasian Journal of Special Education*, *35*(2), 103-116. https://doi.org/10.1375/ajse.35.2.103

Hou, Z. T. (2015). *Teaching Methods and Materials for Students with Physical and Mental Disabilities* (2nd ed.). Taipei: Wunan Books Co., Ltd.

Huang, J. S. (2016). *Research on Curriculum Design with a Focus on Cultivating Preservice Teachers' Visual Instructional Design Ability: A Case Study of "Chemistry Teaching Design and Practice" Course* [Unpublished master's thesis]. Ningxia University, Yinchuan, China.

Huang, Y. C. (2019). Teachers' Professional Ability: Connotation, Components, and Improvement Pathways. *Education Science*, *35*(3), 27-34.

Jia, Y. X. (2008). Thoughts on the Cultivation of Preservice Teachers' Ability of Instructional Design. *Journal of Weifang university*, *8*(2), 148-150.

Jiang, X., & Zeng, L. (2017). Developing Professional Translators with a Social Constructivist Philosophy - Benefits of an Applied Translation Course at the University of Hawaii. *Shanghai Journal of Translators*, (4), 50-55.

Jing, W. H. (1999). Analysis of Bloom's Mastery Learning Theory. *Journal of the Chinese Society of Education*, (3), 39-41.

Johnson, M. (1967). Definitions and models in curriculum theory. *Educational Theory*, *17*(2), 127-140.

Juhler, M. V. (2016). Pre-service teachers' reflections on teaching a physics lesson: How does Lesson Study and Content Representation affect pre-service teachers' potential to start developing PCK during reflections on a physics lesson. *Nordic Studies in Science Education*, *14*(1), 22-37. DOI: https://doi.org/10.5617/nordina.2433

Julian, M. F., Kinzie, M. B., & Larsen, V. A. (2008). Compelling case experiences; Performance, practice, and application for emerging instructional designers. *Performance Improvement Quarterly*, *13*(3), 164-201. https://doi.org/10.1111/j.1937-8327.2000.tb00181.x

Koehler, A. A., Ertmer, P. A., & Newby, T. J. (2018). Developing Preservice teachers' instructional design skills through case-based instruction: Examining the impact of discussion format. *Journal of Teacher Education*, *70*(4), 319-334. https://doi.org/10.1177/0022487118755701

Leeds-Hurwitz, W. (2009). Social construction of reality. In *Encyclopedia of communication theory* (1st ed., pp. 892-895). SAGE Publications Inc.

Leko, M. M., Brownell, M. T., Sindelar, P. T., & Murphy, K. (2012). Promoting special education Preservice teacher expertise. *Focus on Exceptional Children*, *44*(7). https://doi.org/10.17161/fec.v44i7.6684

Lewy, A. (1991). *National and School-Based Curriculum Development* (1st ed.). Paris: UNESCO, International Institute for Educational Planning.

Li, B. S., & Yan, G. C. (2001). *Educational psychology* (1st ed.). Shanghai: East China normal University Press.

Li, K. C. (2016). *Academic evaluation: design and application of multiple evaluation tools*. East China Normal University Press.

Li, L. (2010). *Instructional Design* (1st ed.). Beijing: Higher Education Press.

Li, M. L. (2013). A Perspective on the Current Situation of Preservice teachers' Instructional Design Ability and a Conception of Training Strategies. *Education and Career*, *772*(24), 68-70.

Li, X. C., Qi, C. X., & Shi, X. F. (2013). An empirical study on the development of middle school mathematics teachers' instructional design ability--a case study based on the professional development of teachers in an online training community. *E-learning in China*, (3), 56-61.

Liao, Z. H. (2022). Training of Instructional Design Ability of Preservice Teachers Based on the Evaluation Index System of Instructional Design Competency. *Education in Tibet*, (7), 53-57.

Lin, Z. Y. (2012). Focusing on Cultivating Talents Suitable for the Needs of Employers. *Human Resource Development in China*, (6), 1. DOI:10.16471/j.cnki.11-2822/c.2012.06.007

Liu, F. (2013). On the Formation and Cultivation of Teachers' Instructional Design Ability. *Journal of Mudanjiang College of Education*, *138*(2), 66-67.

Liu, J. (2012). A social constructivist perspective on the teaching of English in sports colleges. *Journal of Northeast Normal University (Philosophy and Social Science Edition)*, (2), 181-184.

Liu, J., Liu, J. G., Li, Y., & Li, Y. L. (2012). Problem representation, attribution and countermeasures of preservice teachers' low instructional design ability. *Primary and Middle School Educational Technology*, (7-8), 39-42.

Liu, Q., & Liao, H. (2018). Study on the Effectiveness of Using Video Cases in Special Education Curriculum Teaching. *Journal of Leshan Normal University*, *33*(10), 134-140.

Liu, Y. H. (2010). *A study of strategies to develop preservice teachers' instructional design ability in a blended learning environment: a case study of mathematics*

preservice teachers from Shanghai Normal University [Unpublished master's thesis]. Shanghai Normal University, Shanghai, China.

Liu, Y. L. (2018). *Research on the Evaluation and Cultivation Strategies of Geographic Preservice Teachers' Instructional Design Ability* [Unpublished master's thesis]. Jiangsu Normal University, Nanjing, China.

Liu, Z. H. (2008). A study on the characteristics of social intelligence development of children with learning difficulties. *Chinese Journal of Special Education*, *15*(6), 29-33.

Liu, Z. P., Liu, M. F., & Lv, J. J. (2009). A study on the Instructional Design Ability and composition of Primary School Mathematics Teachers. *Audio-visual education in China*, (9), 77-81.

Lu, H. M., & Zhong, X. Y. (2013). Investigation and Research on the Current Situation of Cultivation of Informatization Instructional Design Ability of Gratis Preservice Teachers. *Journal of Southwest Agricultural University (Social Sciences Edition)*, *11*(8), 152-155.

Luo, X. D. (2012). On the Composition and Cultivation of Preservice Teachers' Instructional Design Ability. *Journal of China Three Gorges University (Humanities & Social Sciences)*, *34*, 196-197.

Lv, R., Song, L., & Hu, J. P. (2021). Research on the Present Situation and Improvement Strategies of Practical Ability of Normal Students Majoring in Special Education: Take University of Jinan as an Example. *Modern Special Education (Research in Higher Education)*, (16), 21-27.

Läänemets, U., & Kalameers-Ruubel, K. (2013). The Taba-Tyler rationales. *Journal of the American Association for the Advancement of Curriculum Studies*, *9*, 1-12.

Ma, L., & Sheng, Q. L. (2016). *Teacher's development of instructional design ability* (1st ed.). Hangzhou: Zhejiang University Press.

Ma, L., & Zhang, W. H. (2012). *Instructional Design* (1st ed.). Beijing: Higher Education Press.

Ma, Y. S. (2019). *Research on Inquiry-Based Teaching Design Ability and Its Cultivation*

for Science Normal Students [Unpublished doctoral dissertation]. Liaoning Normal University, Shenyang, China.

Mandouit, L., & Hattie, J. (2022). Revisiting “The Power of Feedback” from the perspective of the learner. *Learning and Instruction*, (84), 101718. https://doi.org/10.1016/j.learninstruc.2022.101718

Massouti, A. (2021). Pre-service teachers’ perspectives on their preparation for inclusive teaching: Implications for an organizational change in teacher education. *The Canadian Journal for the Scholarship of Teaching and Learning*, *12*(1), 1-15. https://doi.org/10.5206/cjsotlrcacea.2021.1.10611

McKernan, J. (2007). *Curriculum and imagination: Process theory, pedagogy and action research*. London: Routledge.

Megahed, N. (2012). A Critical Review of the Literature and Practice of Competency Modelling. *Human Resource development Review,*12(1),86-107

Ministry of Education. (2013, September 13). *The Ministry of Education issued the "Professional Standards for Kindergarten Teachers (Trial)" "Professional Standards for Primary School Teachers (Trial)" and Notice of "Professional Standards for Secondary School Teachers (Trial)"*. Government Portal of the Ministry of Education of the People's Republic of China. Retrieved February 17, 2023, from https://www.moe.gov.cn/srcsite/A10/s6991/201209/t20120913_145603.html

Ministry of Education. (2015, September 1). *Notice of the Ministry of Education on Printing and Distributing the "Professional Standards for Special Education Teachers (Trial)"*. Government Portal of the Ministry of Education of the People's Republic of China. Retrieved February 17, 2023, from https://www.moe.gov.cn/srcsite/A10/s6991/201509/t20150901_204894.html

Mulholland, J., & Wallace, J. (2005). Growing the tree of teacher knowledge: Ten years of learning to teach elementary science. *Journal of Research in Science Teaching*, *42*(7), 767-790. https://doi.org/10.1002/tea.20073

Nicol, C. C., & Crespo, S. M. (2006). Learning to teach with mathematics textbooks: How Preservice teachers interpret and use curriculum materials. *Educational Studies in*

Mathematics, *62*(3), 331-355. https://doi.org/10.1007/s10649-006-5423-y

Oliver, A. I. (1977). *Curriculum improvement: A guide to problems, principles, and process*. New York: HarperCollins Publishers.

Orlosky, D. E., & Smith, O. B. (1978). *Curriculum development: Issues and insights*. Chicago: Rand McNally.

Ornstein, A. C., & Hunkins, F. P. (2004). *Curriculum: Foundations, principles, and issues* (4th ed.). Boston: Allyn & Bacon.

Pang, C. H., & Li, X. N. (2010). A Study on Teachers' Instructional Design Ability. *Science and Education Literature*, (3), 7-9.

Pinar, W. F., Reynolds, W. M., Slattery, P., & Taubman, P. M. (1995). *Understanding curriculum: An introduction to the study of historical and contemporary curriculum discourses*. New York: Peter Lang.

Polloway, E., Patton, J., Serna, L., & Bailey, J. (2021). *Strategies for teaching learners with special needs* (10th ed.). Pearson.

Qi, Y., & Zhang, S. (2009). A Review of Teachers' Instructional Design Ability. *Modern educational technology*, *19*(1), 43-46.

Qian, X. L., & Zou, X. (2009). A Review of Instructional Systems Design for Special Education: From Segregation to Integration. *Chinese Journal of Special Education*, *114*(12), 12-17.

Qiao, G. J., & Li, N. N. (2018). Theoretical Interpretation and Practical Implications of Bloom's "Mastery Learning". *Educational Science Research*, (5), 53-57.

Qiao, X. H. (2019). *Research on KI Curriculum promoting the development of Preservice Teachers' Instructional Ability* [Unpublished doctoral dissertation]. East China Normal University, Shanghai, China.

Qin, Z. K. (2001). An analysis of the instructional design ability and their structure of preservice teachers. *Songliao Journal (Education Sciences Edition)*, (4), 16-17.

Rhodes, L. K., & Belly, G. T. (1999). Choices and Consequences in the Renewal of Teacher Education. *Journal of Teacher Education*, (1), 17-26.

Richards, J. C. (2017). *Curriculum development in language teaching* (1st ed.). London:

Cambridge University Press.

Richey, R. (1986). *The Theoretical and Conceptual Bases of Instructional Design*. London: Kogan Page Ltd.

Robinson, D. (2017). Effective inclusive teacher education for special educational needs and disabilities: Some more thoughts on the way forward. *Teaching and Teacher Education*, *61*, 164-178. https://doi.org/10.1016/j.tate.2016.09.007

Roth, W. M. (2000). *in McCormick, R. and Paechter, C. (eds), "Authentic School Science: Intellectual Traditions", Learning & Knowledge* (1st ed.). London, UK: Paul Chapman Publishing.

Rusznyak, L., & Walton, E. (2011). Lesson planning guidelines for student teachers: A scaffold for the development of pedagogical content knowledge. *Education as Change*, *15*(2), 271-285. https://doi.org/10.1080/16823206.2011.619141

Saylor, J. G., & Alexander, W. M. (1954). *Curriculum planning for better teaching and learning*. New York: Rinehart.

Saylor, J. G., Alexander, W. M., & Lewis, A. J. (1981). *Curriculum planning for better teaching and learning*. New York: Holt, Rinehart & Winston.

Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Pearson.

Schwarz, C. V., Gunckel, K. L., Smith, E. L., Covitt, B. A., Bae, M., Enfield, M., & Tsurusaki, B. K. (2008). Helping elementary preservice teachers learn to use curriculum materials for effective science teaching. *Science Education*, *92*(2), 345-377. https://doi.org/10.1002/sce.20243

Sheng, Q. L. (2008). The Implication and Value of Instructional Design. *Journal of Zhejiang Education Institute*, (3), 45-49.

Sheng, Q. L., & Li, X. Q. (1998). *Modern Instructional Design Theory*. Hangzhou: Zhejiang Education Publishing House.

Shi, L. F. (1994). The discernment of curriculum definition. *Education Review*, *4*, 44-47.

Shu, D. F. (2004). *Reform in Foreign Language Teaching: Issues and Strategies* (1st ed.). Shanghai: Shanghai Foreign Language Education Press.

Sindelar, P. T., Brownell, M. T., & Billingsley, B. (2010). Special education teacher

education research: Current status and future directions. *Teacher Education and Special Education*, *33*(1), 8-24. https://doi.org/10.1177/0888406409358593

Smith, B. O. (1969). *Teachers for the real world*. Washington: American Association of Colleges for Teacher Education.

Smith, B. O., Stanley, W. O., & Shores, J. H. (1957). *Fundamentals of curriculum development*. New York: Harcourt Brace Jovanovich.

Song, B., Hu, W. S., & Cheng, H. T. (2014). Reflections on the cultivation of Instructional Design Ability of Preservice Teachers. *University (Academic)*, (7/8), 27-32.

Song, C. (2022). Implications of social constructivist theory for the reform of practical teaching in pre-school education. *Education Observation*, *30*(11), 104-107.

Stein, M. K., & D'Amico, L. (2002). Inquiry at the crossroads of policy and learning: A study of a district-wide literacy initiative. *Teachers College Record: The Voice of Scholarship in Education*, *104*(7), 1313-1344. https://doi.org/10.1177/016146810210400707

Stepich, D. A., Ertmer, P. A., & Lane, M. M. (2001). Problem-solving in a case-based course: Strategies for facilitating coached expertise. *Educational Technology Research and Development*, *49*(3), 53-67. https://doi.org/10.1007/bf02504915

Sui, W. (2019). *Research on Teaching Ability of Teachers in Special Education Schools* [Unpublished master's thesis]. Shandong Normal University, Jinan, China.

Sun, F. X. (2014). On the Improvement of New Teachers' Teaching Design Abilities. *Contemporary Educational Science*, (16), 54-55.

Taba, H. (1932). *The dynamics of education: A methodology of progressive educational thought*. London, UK: K. Paul Trench, Trubner.

Taba, H. (1945). *General techniques of curriculum planning. In N. B. Henry (Ed.), American education in the postwar period, part1 curriculum reconstruction. The forty-fourth yearbook of the National Society for the Study of Education* (1st ed.). Chicago, IL: The University of Chicago Press.

Taba, H. (1945). General techniques of curriculum planning. In *N. B. Henry (Ed.), American education in the postwar period, part1 curriculum reconstruction. The*

forty-forth yearbook of the National Society for the Study of Education (pp. 80-115). Chicago, IL: The University of Chicago Press.

Taba, H. (1962). *Curriculum development: Theory and practice* (1st ed.). New York, NY: Harcourt Brace and World.

Taba, H. (1965). The teaching of thinking. In *R. G. Stauffer (Ed.), Language and the higher thought processes* (pp. 31-39). Champaign, IL: NCTE.

Taba, H. (1967). Implementing thinking as an objective in social studies. In *J. Fair & F. R. Shaftel (Eds.), Effective thinking in the social studies* (pp. 25-49). Washington, DC: NCSS.

Tan, C. H., & Tan, H. B. (2007). Key relationships in the teaching and learning process in a social constructivist perspective. *Journal of the Chinese Society of Education*, (1), 54-56.

Tanner, D., & Tanner, L. N. (2006). *Curriculum development: Theory into practice* (4th ed.). New Jersey: Pearson.

Thorius, K. A. (2016). Stimulating tensions in special education teachers' figured world: An approach toward inclusive education. *International Journal of Inclusive Education*, *20*(12), 1326-1343. https://doi.org/10.1080/13603116.2016.1168877

Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.

Valli, L. (1992). Beginning Teacher Problems: Areas for Teacher Education Improvement. *Action in Teacher Education*, *14*(1), 18-25. DOI: 10.1080/01626620.1992.10462795

Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes* (1st ed.). Harvard University Press.

W. Valencia, S., A. Place, N., D. Martin, S., & L. Grossman, P. (2006). Curriculum materials for elementary reading: Shackles and scaffolds for four beginning teachers. *The Elementary School Journal*, *107*(1), 93-120. https://doi.org/10.1086/509528

Wang, H. (2004). Instructional Design: A Practical Power to Promote Teacher Professional Development. *Educational Science Research*, (4), 71-74. DOI:10.3969/j.issn.1009-

718X.2012.06.016

Wang, H., & Fang, C. C. (2004). The Present Situation and Thinking of Special Education Curriculum Setting in Higher Normal Universities. *Chinese Journal of Special Education*, (6), 78-82. DOI:10.3969/j.issn.1007-3728.2004.06.018

Wang, L. J., Zhang, Y. J., & Li, S. B. (2003). *Instructional Design* (1st ed.). Haikou: Nanhai Publishing Company.

Wang, T. Y. (2018). *A Study of the Teaching Model on BTI based on the Social Constructivism Theory* [Unpublished doctoral dissertation]. Heilongjiang University, Shenyang, China.

Wang, Y. J., & Chen, X. Z. (2007). Suggestions for Investigating and Improving Instructional Design Abilities of Rural Primary School Teachers. *Education Exploration*, (6), 58-59.

Wang, Y., & Wang, C. L. (2022). The Main Contradictions in the Professional Development of Special Education Teachers in China and Their Solutions. *Journal of Suihua University*, *42*(1), 90-93.

Watson, J. (2001). Social constructivism in the classroom. *Support for Learning*, *16*(3), 140-147. https://doi.org/10.1111/1467-9604.00206

West, R. (1994). Needs analysis in language teaching. *Language Teaching*, *27*(1), 1-19. https://doi.org/10.1017/s0261444800007527

Whitehead, A. R. (1967). *The Aims of Education and other Essays*. New York: The Free Press.

Wiles, J. W., & Bondi, J. C. (2019). *Curriculum development: A guide to practice* (9th ed.). New Jersey: Pearson.

Wu, H. W., & Chen, Y. Y. (2005). New advances in the study of language impairment in children with intellectual backwardness. *Chinese Journal of Special Education*, *12*(6), 3-7.

Wu, L. B., Liu, Q. Q., & Gong, Y. N. (2022). Analysis framework of mathematics unit teaching content - taking conic section equation as an example. *Journal of Mathematics (China)*, *61*(10), 16-20.

Wu, M. N. (1994). *Instructional Design* (1st ed.). Beijing: Higher Education Press.

Wu, Y. H., & Reeves, T. C. (2014). Meaningful Interaction in Web-based Learning: A Social Meaningful Interaction in Web-based Learning: A Social Constructivist Interpretation. *Distance Education in China*, (1), 15-24. DOI:10.13541/j.cnki.chinade.2014.01.007

Xie, L. M. (2004). *Instructional Design* (1st ed.). Beijing: Publishing House of Central Radio and Television University.

Xu, H., & Dong, Z. F. (2011). Critical Analysis and Beyond: Revisiting the Concept of "Expert Teachers". *Education Science*, *27*(1), 61-66.

Xu, Y. J., & Q, Y. (2011). *Instructional Design: Principles and Techniques*. Beijing: Education Science Publishing House.

Yan, Y., Wang, S. S., & Lei, J. H. (2009). An exploration of aggressive behavior in children with intellectual backwardness. *Chinese Journal of Special Education*, *16*(12), 36-41.

Yang, G. F. (2005). *Educating Students with Autism* (1st ed.). Taipei: Psychology Press.

Yang, Y. D., & Liu, D. (2007). Rationale and Tools for Measuring Teaching Objectives - Qingpu Experiment's New Century Initiative No. 3. *Shanghai Educational Research*, (10), 43-46.

Yao, J. (2013). A Summary of the Research on Teachers' Instructional Design Ability in China. *Modern Educational Science*, 70-71. DOI:10.13980/j.cnki.xdjykx.gjyj.2013.12.012

Yu, H. D. (2018). A Study on Socially Constructive Networked Translation Teaching Model. *Shanghai Journal of Translators*, (5), 57-61.

Yu, J. B. (2013). Problems and Countermeasures in the Training of Instructional Design Ability of Preservice Teachers Majoring in Mathematics. *Journal of Anshan Normal University*, *15*(2), 8-11.

Yu, S. H. (2012). On the Problems Involving the Undergraduate Specialty of Special Education in China and Relevant Suggestions. *Chinese Journal of Special Education*, *139*(1), 9-13.

Yu, Z. Q. (2010). Three Explicit Stages of Teacher's Development of Instructional Design Ability. *Teaching Monthly: Elementary Edition*, 4-6.

Zhang, J. H., & Chen, J. Z. (2006). Reflections on the Formation and Development of Elementary School Teachers' Classroom Teaching Design Abilities. *Contemporary Educational Science*, (17), 30-33.

Zhang, J. H., Jin, S. H., & Chen, X. Z. (2004). The Development characteristics and influencing factors of Primary School Teachers' Instructional Design Ability. *Psychological Development and Education*, (1), 59-63.

Zhang, R., Liu, X., Yang, Y., Tripp, J., & Shao, B. (2017). Preservice science teachers' instructional design ability: Characteristics and correlations. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(3). https://doi.org/10.12973/ejmste/81553

Zhang, T. T. (2009). An interpretation of Bloom's "mastery learning" teaching theory. *Modern Educational Sciences (General Education Studies)*, (2), 60-62.

Zhang, W. J. (2005). *Individualized education and instructional for mentally handicapped children*. Chongqing: Chongqing Publishing House.

Zhang, W. J., & Yan, X. Q. (2021). *Individualized Education for Special Children: Theory, Planning, and Implementation* (3rd ed.). Chongqing: Chongqing University Press.

Zhang, X. D. (2022). *Research on the Cultivation Model of Interdisciplinary Instructional Design Ability for Preservice Biology Education Teachers* [Unpublished master's thesis]. Shanghai Normal University, Shanghai, China.

Zheng, C. G. (2007). Phases of Teacher Professional Development and Their Knowledge Transformation. *Education Exploration*, *197*(11), 74-75.

Zheng, C. G. (2007). Stage Division of Teacher Professional Development and Knowledge Transformation. *Education Exploration*, *197*(11), 74-75.

Zheng, X. K. (2017). *Research on Special Education Teachers Training in China* [Unpublished doctoral dissertation]. Northeast Normal University, Changchun, China.

Zhong, H. M. (2022). Research on H. Taba's Curriculum Development Theory. *Bulletin of Educational Research*, *68*(1), 75-113.

APPENDICES

Appendix A Experts in this research

Name	Workplace	Professional Position	Instruments
Shen Jianna	Chongqing Education Science Research Institute	Associate Professor	Consistency checking form/ Appropriateness checking form/IOC of instructional Design Checklist
Jiang Xiaoying	Southwest University	Associate Professor	Consistency checking form/ Appropriateness checking form/IOC of instructional Design Checklist
Du Aijing	Chongqing Shapingba District Teachers' Continuing Education College	First-grade Teacher (Primary School)	Consistency checking form/ Appropriateness checking form/IOC of instructional Design Checklist
Wang Tao	Chongqing Normal University	Professor	Consistency checking form/ Appropriateness checking form/IOC of instructional Design Checklist
Xu Bo	Anqing Normal University	Associate Professor	Consistency checking form/ Appropriateness checking form/IOC of instructional Design Checklist
Zhang Jing	Shuangliu County Special Education School, Sichuan Province	Senior Teacher (primary	Teaching Supervisor Interview
Yuan Hongmei	Pidu County Special Education School, Sichuan Province	Senior Teacher (primary school)	Expert Special Education Teacher Interview
Zhang Huina	Tianjin Dongli District Mingqiang Special Education School	Senior Teacher (primary school)	Expert Special Education Teacher Interview

Ge Binbin	Zhejiang Province Tiantai County Special Education Center	Senior Teacher (primary school)	Teaching Supervisor Interview/ Expert Special Education Teacher Interview
Wu Simei	Yongchuan District Special Education School, Chongqing	First-grade Teacher (Primary School)	Teaching Supervisor Interview

Appendix B Interview protocols

Interviewee: expert special education teachers

1. What is your typical process for designing classroom instruction?
2. What knowledge and skills do you frequently utilize when designing instructional activities?
3. What content do you think should be taught in the curriculum "Special Education Instructional Design" offered by universities, and what requirements should it meet? Do you have any suggestions for teaching this curriculum?

Interviewee: teaching supervisor

1. What do you think are the difficulties for teacher trainees, especially those who have just started working, in applying their knowledge and skills in instructional design?
2. What are the current requirements of the Developmental disabilities' Education School for novice teachers in terms of knowledge and skills in instructional design?
3. What content do you think should be taught in the curriculum "Special Education Instructional Design" offered by universities, and what requirements should it meet? Do you have any suggestions for teaching this curriculum?

Interviewee: preservice special education teachers

1. Learning Ability Gap

    What knowledge and skills of instructional design do you currently possess?

    Have you encountered any problems or difficulties during your study of instructional design curriculum?

2. Individualized Learning Desires

    1What knowledge and skills do you hope to acquire after studying instructional design curriculums?

3. Learning Environment Requirements

    Do you have any requirements for the in-class environment of instructional design

curriculums (teaching organization form - whole class, small group, individual / teaching methods)?

Do you have any requirements for the extracurricular environment of instructional design curriculums (participation in teaching practice, influence of extracurricular environment)? What kind of practical opportunities do you expect?

What learning resources or materials do you hope instructional design curriculums can provide?

4. Others

Do you have any suggestions for instructional design curriculums?

Is there anything else you would like to add or include?

Post-Curriculum Implementation Interview for preservice special education teachers

1. What have you gained from studying this curriculum?

2. What has left the deepest impression on you about this curriculum?

3. What are your overall feelings about this curriculum?

4. What adjustments and improvements do you think could be made to this curriculum? For example, in terms of curriculum content, scheduling, teaching methods, etc.

Appendix C Instructional design ability assessment scale

Name of Instructor: Course tittle:

Evaluator: Date:

Rating scale: each item below should be assessed using this scale: please put the number in the rating box next to the item.

1 = No relevant information

2 = A few relevant statements

3 = Some relevant statements

4 = Complete relevant statements

5 = High-quality statements

Dimension	Indicator	Scale				
		1	2	3	4	5
Instructional content analysis	State the source of teaching content					
	Analyze the connections of knowledge before and after, based on the discipline's characteristics					
	State the function of the teaching content					
	Analyze the knowledge points in the teaching content					
	Identify the key points in the teaching content					
	Analyze the main content of the textbooks					
	Analyze the content, quantity, difficulty, usage, and function of the exercises in the textbook					
	Analyze the nature of the primary teaching content					
	Analyze the prerequisite abilities needed for learning the content					
Analysis of learners	Analyze learners' general characteristics: gender, age, type and degree of disability, perception status, grade level, life					

with special needs	experience, and social background					
	Analyzes learners' current cognitive stage					
	Analyzes learners' starting level in conjunction with the teaching content					
	Analyzes learners' information processing style, sensory reception, emotional and social needs, environmental and emotional needs					
	Analyzes learners' learning motivation					
Instructional objective design	Completeness of teaching objectives					
	State teaching objectives accurately, specifically, concisely					
	Alignment of teaching objectives with the functional analysis of the teaching content and the starting level analysis results					
	Alignment of teaching objectives with the discipline content and characteristics					
Individual instructional objective design for learners with special needs	Consistency between individualized instructional objectives and the content of instructional objective					
	Design of individualized instructional objectives based on learners' starting levels					
	Identification of individualized teaching objectives for learners at different ability levels in the table					
Instructional strategy design for learners with special needs	Appropriateness of teacher and student activities designed based on the type of knowledge in the instructional content					
	Rational sequence of teaching activities					
	Design of teacher and student activities based on the chosen teaching methods					
	Coverage of all knowledge points in the selected teaching					

	content by teacher and student activities					
	Design of seating arrangements in teaching					
	Selection of teaching media based on teacher and student activities, and teaching objectives					
	Alignment of teacher activities, student activities, teaching methods, teaching media, teaching objectives, and seating arrangements in format					
	Design of teaching objectives based on knowledge points, teacher activities, and student activities					
Instructional process design for leaners with special needs	Design the instructional process completely: ensure alignment with the content of the knowledge structure analysis, consistency between teaching activities and teaching methods, and alignment between teaching activities and teaching objectives.					
	Design the instructional process in detail: include teaching segments and time allocation, teacher and student activities, selection of appropriate teaching methods, design of teaching media and seating arrangements according to the teaching schedule, and the design of individualized teaching activities and individualized teaching objectives for each teaching segment.					
Instructional media design for learners with special needs	Selection of teaching media based on students' cognitive stages					
	Design of the timing for presenting teaching resources					
	Design of the time usage for teaching resources in various teacher and student activities					
Instructional	Design of teaching evaluation methods based on teaching					

evaluation	objectives and students' starting levels					
design for learners with special needs	Reasonableness of the teaching evaluation criteria					

Suggestion for this design:

Appendix D The results of quality checking of draft curriculum

Mean score of consistency checking form

Items	Jiang	Shen	Du	Wang	Xu	Mean Score
Learning problem with the principles of the curriculum	1	1	1	1	1	1
Curriculum principles and Curriculum aims	1	1	1	1	0	0.8
Principles of curriculum and learning activities	1	1	1	1	1	1
Curriculum aims and Curriculum content	1	1	1	1	1	1
Curriculum aims and learning activities	1	1	0	1	1	0.8
Curriculum content and learning activities	1	1	1	1	1	1
Curriculum content and learning materials	1	1	1	1	1	1
Curriculum content and learning resources	1	1	1	1	1	1
Curriculum content and learning duration	1	1	0	1	1	0.8
Curriculum assessment with Curriculum aims	1	1	0	1	1	0.8

Mean score of appropriateness checking form

Domain	Items	Jiang	Shen	Du	Wang	Xu	Mean Score
curriculum principles	1.1 Reasonable	5	4	4	5	5	4.6
	1.2 Theoretical concepts used to support	4	4	5	5	5	4.6
	1.3 Lead to practice	5	4	4	5	5	4.6
curriculum objectives	2.1 Clear and concrete	4	5	4	5	4	4.4
	2.2 Can be measured and evaluated	4	4	4	5	5	4.4
	2.3 Suitable for the target group	5	4	5	5	5	4.8
curriculum content	3.1 Meet the curriculum objectives	5	5	5	5	5	5
	3.2 Academically correct	5	5	5	5	5	5
	3.3 Suitable for the target group	5	5	5	5	5	5
learning activities	4.1 Meet the curriculum objectives	5	5	5	5	5	5
	4.2 Suitable for the target group	5	5	5	5	5	5
	4.3 Interesting and possible	5	4	4	5	5	4.6
curriculum materials	5.1 Meet the learning activities	5	5	4	5	5	4.8
	5.2 Suitable for the target group	5	5	5	5	5	5
	5.3 Interesting and possible	5	4	3	5	5	4.4
curriculum evaluation	6.1 Meet the curriculum objectives	4	5	5	5	4	4.6
	6.2 Suitable for the target group	5	5	5	5	5	5
	6.3 Possible to practice	5	5	4	5	5	4.8

Appendix E The IOC of instructional design ability assessment scale

Item	Valid	Missing	Mean
Item1	5	0	1.00
Item2	5	0	1.00
Item3	5	0	1.00
Item4	5	0	1.00
Item5	5	0	1.00
Item6	5	0	1.00
Item7	5	0	1.00
Item8	5	0	1.00
Item9	5	0	1.00
Item10	5	0	1.00
Item11	5	0	1.00
Item12	5	0	1.00
Item13	5	0	1.00
Item14	5	0	1.00
Item15	5	0	1.00
Item16	5	0	1.00
Item17	5	0	1.00
Item18	5	0	1.00
Item19	5	0	1.00
Item20	5	0	1.00
Item21	5	0	1.00
Item22	5	0	1.00
Item23	5	0	0.80
Item24	5	0	1.00
Item25	5	0	1.00
Item26	5	0	1.00
Item27	5	0	1.00
Item28	5	0	1.00
Item29	5	0	1.00

Item30	5	0	0.80
Item31	5	0	1.00
Item32	5	0	0.80
Item32	5	0	1.00
Item34	5	0	1.00
Item35	5	0	0.80
Item36	5	0	1.00
Item37	5	0	1.00
Item38	5	0	0.80
Item39	5	0	1.00

The result of Item-Total Statistics of instructional design ability assessment scale

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item1	140.27	389.131	.438	.651	.926
Item2	140.92	387.551	.420	.466	.927
Item3	140.34	391.021	.552	.553	.925
Item4	140.37	392.236	.534	.655	.925
Item5	140.57	387.520	.463	.540	.926
Item6	140.72	376.250	.585	.772	.925
Item7	141.63	377.236	.553	.562	.925
Item8	140.48	391.866	.399	.636	.927
Item9	140.63	391.668	.373	.612	.927
Item10	140.66	394.112	.426	.593	.926
Item11	140.56	384.499	.478	.632	.926
Item12	140.87	382.709	.549	.741	.925
Item13	140.96	378.975	.610	.661	.924
Item14	140.78	382.017	.506	.739	.926
Item15	140.04	393.180	.541	.692	.925

Item16	140.18	391.558	.572	.689	.925
Item17	140.66	392.771	.524	.724	.925
Item18	140.30	390.850	.674	.746	.924
Item19	140.47	386.479	.537	.697	.925
Item20	140.90	379.796	.614	.811	.924
Item21	140.36	391.824	.407	.793	.926
Item22	140.45	392.909	.608	.678	.925
Item23	140.28	391.727	.586	.753	.925
Item24	140.25	393.893	.529	.615	.925
Item25	140.37	396.850	.452	.590	.926
Item26	140.22	393.813	.360	.518	.927
Item27	140.25	394.461	.436	.612	.926
Item28	140.25	389.802	.538	.632	.925
Item29	140.62	393.807	.465	.610	.926
Item30	140.25	392.097	.566	.745	.925
Item31	140.34	389.749	.643	.732	.924
Item32	140.26	392.876	.499	.688	.926
Item32	140.44	386.590	.656	.656	.924
Item34	140.87	391.004	.365	.731	.927
Item35	140.66	383.112	.558	.736	.925
Item36	140.31	396.991	.311	.681	.927

Appendix F

The score of learners in each assessment

No.	O-pre	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	O13	O-post
1	51	32	17	17	12	32	7	12	5	147	153	168	168	152	172
2	72	31	24	18	12	32	7	12	8	121	160	159	162	172	178
3	73	28	18	13	11	32	7	12	5	155	150	144	165	157	174
4	66	40	22	17	12	32	7	12	5	165	138	168	166	171	157
5	66	31	21	17	12	32	7	12	5	151	158	157	170	178	162
6	63	33	16	14	11	32	7	12	8	165	138	168	166	153	157
7	72	29	22	17	12	32	8	12	5	121	160	159	162	155	178
8	69	36	22	17	12	32	7	12	8	147	153	168	168	165	172
9	64	32	24	17	12	32	7	12	8	119	168	172	171	156	169
10	62	36	21	13	11	29	7	12	7	119	143	169	163	165	156
11	57	31	23	17	12	32	7	12	5	165	138	168	166	165	157
12	52	31	22	17	12	32	7	12	8	155	163	147	155	162	169
13	72	36	21	16	12	32	7	12	5	136	146	157	157	174	165
14	80	37	23	17	12	32	7	12	8	155	163	147	155	168	169
15	60	34	21	17	12	22	6	10	7	116	139	157	123	157	135
16	55	36	20	13	11	30	7	12	5	155	150	144	165	153	174
17	57	36	24	17	12	30	7	12	5	147	153	168	168	164	172
18	75	28	25	17	12	30	7	12	8	121	160	159	162	170	178

19	61	33	25	17	12	23	6	12	7	119	143	169	163	163	156
20	58	35	24	17	12	30	7	12	7	155	163	147	155	154	169
21	56	26	20	17	12	32	7	12	8	155	163	147	155	155	169
22	70	30	19	17	12	32	7	12	5	121	160	159	162	162	178
23	61	12	10	12	9	17	4	8	5	140	163	126	145	114	159
24	58	39	20	15	12	29	7	12	7	155	150	144	165	167	174
25	75	41	25	15	12	30	7	12	5	119	168	172	171	171	169
26	67	32	10	12	9	30	7	12	5	119	143	169	163	122	156
27	75	37	24	17	12	29	7	12	5	136	146	157	157	159	165
28	63	40	25	17	12	30	7	12	5	151	158	157	170	178	162
29	61	37	25	16	12	30	7	13	5	140	163	126	145	163	159
30	66	39	20	17	12	32	7	12	8	155	150	144	165	173	174
31	60	36	25	17	12	32	7	13	8	151	158	157	170	180	162
32	76	34	25	17	12	32	7	12	8	119	168	172	171	180	169

No.= Learners' Number

Appendix G Curriculum of Instructional design curriculum in special education

Section 1 The nature of instructional design curriculum in special education curriculum

The course "Instructional design curriculum in special education" is a core professional course for pre-service special education teachers, emphasizing both theory and practice. It aims to provide learners with a comprehensive understanding of instructional design theories and the ability to apply these theories to design a lesson. Throughout the instructional design process, learners will explore the interconnections between various components, develop logical thinking skills, and be guided to respect life, care for special needs students, cultivate humanitarian spirit, and form correct professional perspectives and values.

Section 2 The Curriculum

1. The principles of the curriculum

1.1 Gradually promoting deep learning in students

The memorization and comprehension of theoretical knowledge serve as the foundation for practice, which in turn facilitates learners' understanding of the knowledge. This curriculum should be implemented by using independent thematic modules as the basis, progressively advancing the overall development of each module and integrating practice in new environments. During the theoretical knowledge modules, practical application examples should be incorporated, along with designed practical exercises, to help learners understand, master, and apply the knowledge they have acquired. This approach aims to cultivate relevant skills and facilitate the transformation of knowledge within independent thematic modules. By creating a cohesive knowledge chain and integrating skills in the overall module, and consolidating practice in new contexts, learners' instructional design abilities are significantly enhanced.

1.2 Emphasis on developing logical thinking skills

To cultivate learners' logical thinking skills in the curriculum, instructors must carefully select and organize the instructional content and employ a variety of

effective teaching methods. Firstly, instructors should choose content with a clear structure and strong internal logic to help learners better understand and grasp the interconnections between concepts. Additionally, knowledge should be organized in a logical sequence, guiding learners to gradually build a comprehensive knowledge system.

Heuristic teaching is an excellent method to achieve this goal. By posing thought-provoking questions and providing guidance, instructors can stimulate learners' active thinking and encourage them to engage in problem-solving, thereby developing their logical thinking skills. The course aims to enable learners to design individual lessons for children with various types and degrees of developmental disorders. During instruction, teachers should guide learners to analyze and resolve issues in instructional design, fostering their reasoning and analytical skills and teaching them how to apply logical thinking to problem-solving.

Moreover, incorporating group discussions into the curriculum can be highly beneficial. Through group discussions, learners can exchange ideas, engage in debates, and solve problems using critical thinking and teamwork. This approach not only enhances learners' logical thinking skills but also improves their communication and collaboration abilities.

In addition, instructors need to provide timely and targeted feedback and suggestions. By observing learners' progress, identifying gaps in their logical thinking during instructional design, and offering specific guidance, instructors can help learners correct misconceptions and flawed methods promptly, thereby enhancing their logical thinking skills.

1.3 Integrating life education

In teaching, instructors should incorporate life education, emphasizing respect and value for every individual, including learners with special needs. These learners are not merely passive recipients or weak individuals; they are vibrant individuals with boundless potential. Therefore, during the curriculum, instructors should guide learners to focus on the personalized growth process of each student, respecting

and understanding their individual differences and unique values. This respect and attention should go beyond theoretical discussions and be concretely applied in the instructional design for special needs learners.

Through the integration of life education, this curriculum aims to cultivate educators who possess both professional skills and a deep sense of human compassion. These educators will adopt a more inclusive and respectful approach, supporting special needs learners to bravely progress on their growth journey and ultimately shine with their own unique brilliance.

2. Curriculum design rationale

2.1 Design curriculum objectives, organize curriculum content, and select curriculum materials based on the elements of teaching design for children with developmental disorders.

Instructional design operates on three levels: macro, meso, and micro. Macro-level design involves overarching plans, such as national strategies for preschool, school-age, and vocational education. Meso-level design includes semester plans, and monthly, weekly, and daily activities. Micro-level design focuses on daily plans and individual lesson plans.

In typical educational settings, the process model is widely used for instructional design. Although the developmental starting points and rates for children with developmental disorders differ from those of typically developing children, their developmental processes are similar. Special education shares many similarities with general education but incorporates additional considerations. These include reducing the quantity and scale of tasks, individualizing instructional content, processes, and assessments, diversifying instructional strategies, and utilizing assistive technology to meet the diverse needs of all learners. These adaptations ensure that classroom activities are better suited to the needs of learners with developmental disorders.

From the perspective of the process model of instructional design, these adjustments modify the content within each component without altering the fundamental elements and procedures of instructional design. However, given the significant

variability among children with developmental disorders, it is essential to establish individualized instructional objectives to meet their unique needs.

The wide range of disabilities and their varying severity levels present significant challenges for teaching and require advanced instructional design skills. Such skills enable pre-service special education teachers to effectively teach students with visual and hearing impairments, as well as typically developing children. For new special education teachers, the primary task is to meticulously design each teaching plan. Thus, this curriculum is structured around the subject curriculum and textbook system of the national curriculum, focusing on the elements of teaching design for classroom teaching of children with developmental disorders. The aim is to enhance pre-service special education teachers' ability to design individual lessons effectively.

To create a teaching atmosphere that closely mirrors actual practice, the curriculum employs the textbooks and assessment reports of developmental disabilities as materials for various exercises. Additionally, children with developmental disorders are recruited as actual teaching subjects, allowing learners to refine and optimize their teaching designs through hands-on practice continually. The curriculum also provides a wealth of teaching plans and classroom video case studies involving developmental disabilities. These resources are available for learners to observe and study, aiding them in better understanding and mastering the essentials of instructional design.

2.2 Learning activities in the curriculum based on ability development pathways

Modern professional education should tightly integrate knowledge and practice within each learning unit, with the goal of transforming professional knowledge into competencies. According to the theory of deep learning, this transformation involves three stages: surface, deep, and transfer. Surface learning involves focusing on one task at a time to enhance knowledge retention and comprehension, and skill development through practice. Deep learning occurs when learners, through peer interaction, identify connections, relationships, and patterns among concepts, organizing skills and concepts to achieve skill integration. Transfer learning is achieved

when learners begin to apply the acquired knowledge or skills in increasingly novel contexts, thus enhancing their competencies.

Educators should guide learners through opportunities that facilitate continuous cycling through these three levels of learning, enabling deeper learning. Therefore, the curriculum content organization and implementation adhere to these principles to achieve progressive knowledge advancement.

2.3 Assess learners' achievements based on the quality of their teaching plans.

According to Bloom's taxonomy, "application" builds on the foundations of knowledge retention and comprehension. For this curriculum, the most effective way to determine whether preservice special education teachers have mastered the theoretical elements of instructional design and can apply them is through their instructional design work—lesson plans. Thus, the curriculum evaluates learners' achievements by assessing their teaching plans, which reflect their grasp of instructional design principles and their ability to apply them effectively.

3. Curriculum objectives

Through three stages of learning, the learners will be able to understand the theoretical knowledge of instructional design for children with developmental disorders and apply it to the design of single lessons for these children. Specifically, learners will develop the following abilities:

- Analysis ability: Ability to analyze nationally issued or self-compiled textbooks and to assess the learning conditions of special needs learners.

- Design ability: Ability to design instructional objectives based on the analysis of instructional content and learners. This includes creating individualized instructional objectives for learners at different ability levels within a class, designing differentiated instructional strategies, selecting appropriate instructional media and assistive technologies based on learners' ability levels and cognitive stages, and planning the timing, duration, and frequency of instructional media presentations as well as differentiated teacher-student interaction processes.

- Evaluation ability: Ability to design differentiated evaluation methods and standards based on the varied levels of learners.

4. Curriculum content

The curriculum content is divided into two main modules: An Overview of Special Education Instructional Design and the Process of Special Education Instructional Design.

4.1 The overview of special education instructional design covers the following:

- The definition and meaning of instructional design;

- Theoretical foundations;

- Comparison of instructional design models in general and special education;

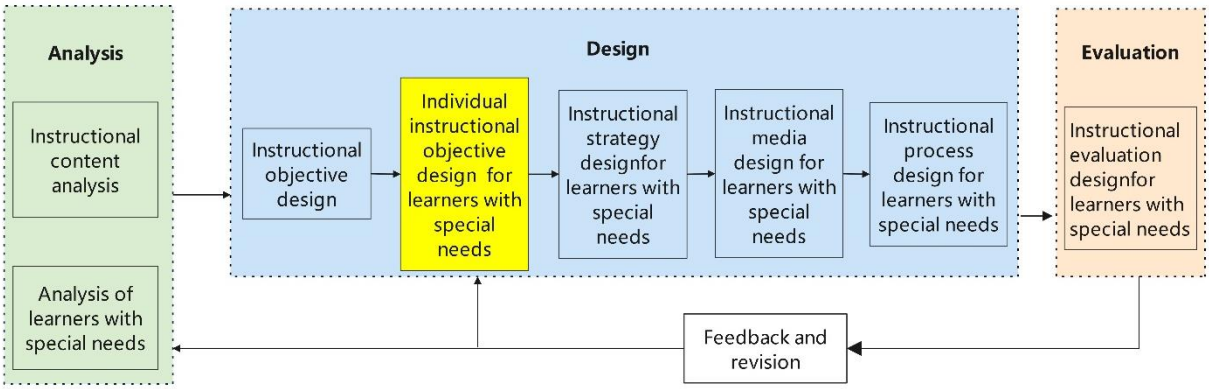
4.2 The Process of Special Education Instructional Design is based on the process model of instructional design and follows instructional practice, encompassing three main parts: analysis, design, and evaluation.

- Analysis: This includes both content analysis and learner analysis. Structural analysis within content analysis involves examining the knowledge structure, instructional structure, key points, and difficulties (He, 2014). Consequently, a separate analysis of key and difficult points is not provided within the entire instructional design process.

- Design: This involves designing overall instructional objectives, individual instructional objectives, instructional strategies, instructional media, and the instructional process.

- Evaluation: This involves the design of assessment methods and criteria.

The curriculum content modules are illustrated in the figure below.



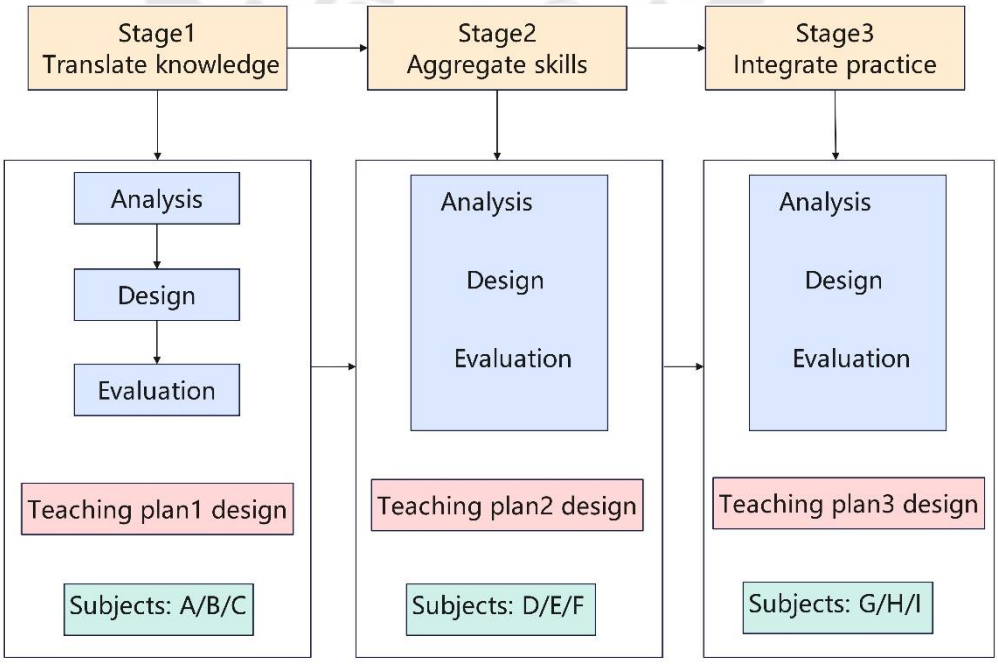
When organizing the content of this curriculum, in addition to considering the knowledge points involved in the process model of special education instructional design, it also analyzes the subjects and curriculum content that have been learned in the learner training plan, and organizes the curriculum content based on the above two aspects. The specific content is shown in the table below:

Learning Unit		Content
The concept of instructional design curriculum in special education		● The definition of the instructional design ● The theoretical basis of instructional design ● The instructional design model in general education and special education
Analyze	Instructional content analysis	● Definitions and components ● The procedure of instructional content analysis
	Analysis of learners with special needs	● Definitions and domains ● The procedure of learner analysis for children with special needs
Design	Instructional objective design	● Domains ● The procedure of instructional objective design
	Individual instructional objective design for learners with special needs	● Definitions ● Strategies for instructional objective adjustment for children with special needs

	Instructional strategy design for learners with special needs	● The components of instructional strategy in design ● The procedure of instructional strategy design for children with special needs
Design	Instructional media design for learners with special needs	● Instructional strategies design techniques for children with special needs
	Instructional process design for learners with special needs	● The content of the instructional process design ● The procedure of instructional process design for children with special needs
Evaluation	Instructional evaluation design for learners with special needs	● The method of instructional evaluation ● The procedure of instructional evaluation design procedure for children with special needs

5. Curriculum implementation stages

The implementation of this curriculum integrates mastery learning theory, social constructivist theory, and competency development pathways, dividing instruction into three stages.



5.1 Knowledge translation stage

This stage focuses on theoretical knowledge acquisition through individual thematic modules. It promotes students' understanding of theoretical concepts via applied practice, thereby developing skills through knowledge comprehension and achieving knowledge transformation. The process follows the sequence: explanation—demonstration—practice. After the teacher explains the relevant knowledge points, they demonstrate how to apply these points using examples from children with developmental disorders and their textbooks. Students are then provided with assessment reports and current textbooks for children with developmental disorders to practice applying the knowledge points. For instance, in the thematic module on instructional content analysis, the teacher explains the knowledge points involved and demonstrates their application one by one. Learners are then tasked with analyzing instructional content based on given cases and textbooks. The completion of all thematic modules signifies the completion of the entire instructional design. This stage emphasizes independent thinking, requiring each learner to submit their practice exercises.

5.2 Skill aggregation stage

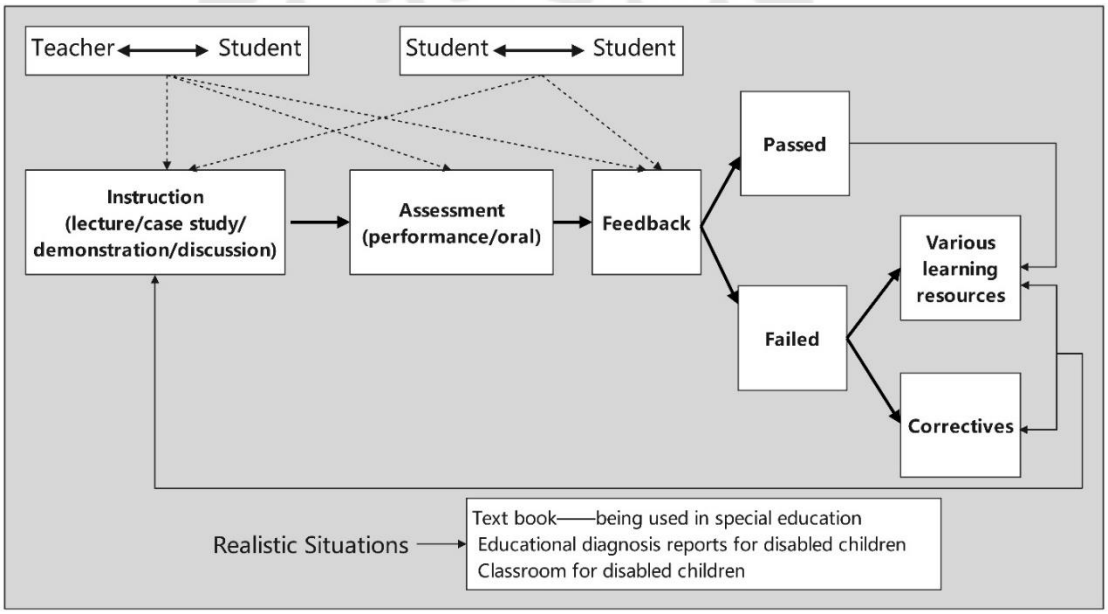
This stage emphasizes group learning through the design—implementation—modification of lesson plans. New tasks are introduced to encourage continuous interaction and reflection among learners, integrating the knowledge and skills from individual thematic modules into a cohesive knowledge structure network, thus promoting skill aggregation. The new task involves designing lesson plans for new cases using the textbooks from the knowledge transformation stage, implementing them, and modifying them based on the implementation outcomes. Each design—implementation—modification cycle counts as one round, and each group must complete at least three rounds with different teachers each time. Group submissions are required for this stage, and the teacher evaluates the reasonableness of each lesson plan designed in each round.

5.3 Practice integration stage

This stage focuses on integrating practice through the application of new situations. Different groups of learners design lesson plans for different learners using various textbooks and implement them on-site. Submissions are evaluated by the teacher. Learners also enhance their instructional design abilities by taking on different roles, such as filming instructional videos, acting as the main teacher, assistant teacher, and evaluator, allowing them to observe and reflect on classroom teaching from multiple perspectives.

6. Learning activities in the curriculum

In these three stages, the learning activities are shown as below.



The instructor utilizes lectures, case studies, demonstrations, and discussions in teaching. This approach incorporates teacher-student and student-student discussions. Coursework, based on theoretical content, are assigned and learners are required to submit their work in the QQ group. Each practice exercise submitted by preservice special education teachers is posted in the course's QQ group for review. The teacher provides individual feedback based on corresponding assessment criteria. Passing the standard indicates success, while failing to meet the standard results in a non-passing mark. For students who pass, additional resources are

provided to further their knowledge. For those who do not pass, the teacher offers feedback, demonstrations, and multiple teaching sessions until they meet the passing criteria.

Throughout the learning process, the instructor provides frequent feedback to students and offers various resources for further study and reference, such as PPTs, examples, and specific evaluation criteria. Additional support is available through online Q&A sessions, one-on-one offline guidance, and group study sessions.

Curriculum implementation process

7. The arrangements of the curriculum

This curriculum has a total of 48 class periods and is divided into 24 times, each time 2 class periods, 45 minutes per class period. The implementing plan is distributed as follows:

Stage	Class period		Content	Total
	Theory	Practice		
Stage 1	2		An Overview of Instructional Design for Special Education	3 2
	2		Instructional Content Analysis	
		2	Instructional Content Analysis	
		2	Instructional Content Analysis	
		2	Instructional Content Analysis	
	1	1	Analysis of learners with special needs	
	2		Instructional objective design	
		2	Instructional objective design	
	2		Individualized instructional objective design for learners with special needs	
		2	Individualized instructional objective design for learners with special needs	
	2		Instructional strategy design for learners with special needs	
		2	Instructional strategy design for learners with special needs	

		2	Instructional strategy design for learners with special needs	
	2		Instructional process design for learners with special needs	
		2	Instructional process design for learners with special needs	
	1	1	Instructional evaluation design for learners with special needs	
Stage 2	2		Design and discussion of teaching plan 2	1 2
	2		Implementation of teaching plan 2	
	2		Discussion and revision of teaching plan 2 (formed teaching plan3)	
	2		Implementation of teaching plan 3	
	2		Discussion and revision of teaching plan 3 (formed teaching plan 4)	
	2		Implementation, discussion and revision of teaching plan 4 (formed teaching plan 5)	
Stage 3	2		Design and discussion of teaching plan 6	4
	2		Implementation and discussion of teaching 6	

And the specific implementing plan is shown in table below.

Class	Instructional contents	Objectives	Teaching & learning activities	Instructional method	Learning materials	Assignments	Evaluation
2	Instructional design curriculum in special education	1.Understand the definition of instructional design 2. understand the theoretical basis of instructional design 3. understand instructional design process model of special education	1. The learners observe two pictures: identify which pictures have learning in them and analyze what learning is, how it happens and what the role of the teacher is(5min). 2. The instructor gives a lecture about the definition of instructional design(5min). 3. The instructor introduces theoretical foundations of instructional design: systems theory, communication theory, learning theory, instructional theory(30min). 4. The instructor introduces instructional design model in general education(10min). 5. The instructor presents pictures of ordinary children and disabled children, analyze the difference between exceptional children and regular children(10min). 6. The instructor introduces the adaptions in clinical teaching of special education(20min). 7. The instructor introduces the instructional design model in special education(10min).	Lecture Discussion	Slides: an overview of instructional design;	Discussion: why should instructional design be based on these four theories?	1. Oral assessment: 2. Explain the definition of instructional design in your own words. 3. Give an overview of the influence of four basic theories on instructional design. 4. Briefly describe the process of instructional design of special education in one's own words.
2	Instructional content	1. Understand the components	1. The instructor gives a lecture of the definitions	Lecture Discussion	Slides: instructio	Assignment 1 (submit	Performanc e

	analysis	of instructional content analysis	and components of instructional content analysis (15min). 2. The instructor gives a lecture of the procedure and demonstration of each component of instructional content analysis(50min). 3. The instructor presents incorrect examples of instructional content analysis, analyzes and discusses with learners (25).		nal content analysis	assignments up to QQ group): complete instructional content analysis of teaching plan 1.	assessment: analyze the instructional content according to the textbooks.
2	Instructional content analysis	1.Understand the procedure and techniques of instructional content analysis	1. The instructor asks the learners what difficulties they encountered in completing the instructional content analysis and what questions they have. Afterwards, the teacher provides a detailed explanation(25min). 2. The instructor presents some incorrect sections from learners' assignment1, discussed with learners and gives them correctives(25min). 3. The instructor discusses the techniques needed for instructional content analysis with learners(10min). 4. The instructor summarizes the considerations in instructional content analysis(5min). 5. The learners discuss and revise assignment 1(25min).	Lecture Case study Discussion	Life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 1 (submit assignments up to QQ group)	Performance assessment: analyze the instructional content according to the textbooks.
2	Instructional	1. Master the	1. The instructor asks the	Discussion	Life-	Revise	Performanc

	content analysis	procedure and techniques of instructional content analysis	learners what difficulties they encountered in completing the instructional content analysis and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 1, discussed with learners and gives them correctives(30min). 3. The instructor highlights the considerations in instructional content analysis(5min). 4. The learners discuss and revise assignment 1, the instructor gives them itinerant guidance (35min).	case study	Chinese or life-math, or life-adaption textbook for special education schools	assignment 1 (submit assignments up to QQ group)	e assessment: analyze the instructional content according to the textbooks.
2	Learner analysis for children with special needs	1. Master the procedure and techniques for each dimension of learner analysis	1. The instructor gives a lecture about domains of learners' analysis for children with special needs (15min). 2. The instructor gives a lecture about the procedure of leaners analysis for children with special needs and demonstrates each process (50min). 3. The instructor presents incorrect examples of leaners analysis for children with special needs, analyzes and discusses with learners (25).	Lecture Case study Discussion	Three educational diagnosis reports; slides: learner analysis; life-Chinese or life-math, or life-adaption textbook for special education schools	Assignment 2 (submit assignments up to QQ group): complete learner analysis of teaching plan 1.	Performanc e assessment: analyze the learners based on the textbooks and the three educational diagnosis reports.
2	Instructional	1. Understand	1. The instructor presents	Lecture	Three	Assignment 3	Performanc

	objectives design	the procedure and techniques of instructional objective design	some incorrect sections from learners' assignment 2, discussed with learners and gives them correctives(10min). 2. The instructor gives a lecture about the domains of instructional objectives and demonstrates the technique of each domain of instructional objectives design (45min). 3. The instructor presents incorrect examples of instructional content analysis, analyzes and discusses with learners (35min).	Case study Discussion	educational diagnosis reports; slides: instructional objectives design; life-Chinese or life-math, or life-adaption textbook for special education schools	(submit assignments up to QQ group): complete instructional objectives design of teaching plan 1 based on these three children and textbooks	e assessment: design the instructional objectives for the whole lesson.
2	Instructional objectives design	1. Master the procedure and techniques of the instructional objective design	1. The instructor asks the learners what difficulties they encountered in completing the instructional objective design and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 3, discussed with learners and gives them correctives(30min). 3. The instructor highlights the considerations in instructional objective design(5min). 4. The learners discuss and revise assignment 3, the instructor gives them itinerant guidance	Case study Discussion	Three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 3 (submit assignments up to QQ group).	Performance assessment: design the instructional objectives for the whole lesson.

			(35min).				
2	Individual instructional objectives design for children with special needs	1. Understand strategies for instructional objective adjustment for children with special needs	1. The instructor presents some incorrect sections from learners' assignment 3, discussed with learners and gives them correctives(10min). 2. The instructor gives a lecture about the reasons of the adaption of instructional objectives for children with special needs(5min). 3. The instructor requires the learners read the materials and answer these questions: how is multilevel instructional realized? What are the characteristics of the objectives in multilevel teaching (25min)? 4. The instructor gives a lecture about the strategy of determining the overall objectives: analyzing the main content of the material and the starting level of children and finding out objectives that are suitable for most children(10min). 5. The teacher explains the strategy for decreasing difficulty based on the overall objectives, and adapts it to the starting level of the children with special needs(10min). 6. The teacher explains the strategy for increasing difficulty based on the overall objectives, and adapts it to the starting	Lecture; self-learning; discussion	Literature: multilevel instructional objectives adaptations; mathematics multilevel instructional objectives design in math; three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	Assignment 4 (submit assignments up to QQ group): complete individual instructional objectives design of teaching plan 1.	Performance assessment: design individual instructional objectives for these three children.

			level of the children with special needs(10min). 7. The instructor presents incorrect examples of individual instructional objective design, analyzes and discusses with learners(20min).				
2	Individual instructional objectives design for children with special needs	1. Master strategies for design individual instructional objectives for children with special needs	1. The instructor asks the learners what difficulties they encountered in completing the individual instructional objective design and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 4, discussed with learners and gives them correctives(30min). 3. The instructor concludes the considerations in individual instructional objective design(5min). 4. The learners discuss and revise assignment 4, the instructor gives them itinerant guidance (35min).	Discussion case study	Three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 4 (submit assignments up to QQ group).	Performance assessment: design individual instructional objectives for three children.
2	Instructional strategy design for children with special needs	1. Understand the procedure and techniques of instructional strategy design for children with special needs	1. The instructor presents some incorrect sections from learners' assignment 4, discussed with learners and gives them correctives(10min). 2. The instructor gives a lecture about the components of instructional strategy for children with special	Lecture Case study Discussion	Three educational diagnosis reports; slides: instructional strategies design for children	Assignment 5 (submit assignments up to QQ group): complete instructional strategy design of teaching plan 1.	Performance assessment: design the instructional strategy for these three children.

			needs (5min). 3. The instructor gives a lecture about the procedure of instructional strategy design for children with special needs and demonstrates each process(45min). 4. The instructor presents incorrect examples of instructional strategy design, analyzes and discusses with learners(30min).		with special needs; life-Chinese or life-math, or life-adaption textbook for special education schools		
2	Instructional strategy design for children with special needs	1. Master the procedure and techniques of instructional strategy design for children with special needs	1. The instructor asks the learners what difficulties they encountered in completing the instructional strategy design and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 5, discussed with learners and gives them correctives(30min). 3. The instructor concludes the considerations in instructional strategy design(5min). 4. The learners discuss and revise assignment 5, the instructor gives them itinerant guidance (35min).	Discussion Case study	Three educational diagnosis reports; slides: instructional strategies design for children with special needs; life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 5 (submit assignments up to QQ group).	Performance assessment: design the instructional strategies for these three children.
2	Instructional media design for children with special	1. Master the instructional strategies design procedure and techniques for	1. The instructor presents some incorrect sections from learners' assignment 5, discussed with learners and gives them	Lecture Case study Discussion	Three educational diagnosis reports;	Assignment 6 (submit assignments up to QQ group):	Performance assessment: design the instructional

	needs	children with special needs	correctives(10min). (20min). 2. The instructor gives a lecture about the source of instructional media for children with special needs, and design techniques and demonstrates each process(40min). 3. The instructor presents incorrect examples of instructional media design, analyzes and discusses with learners(30min).		slides: instructional media design for children with special needs; life-Chinese or life-math, or life-adaption textbook for special education schools	complete instructional media design of teaching plan 1.	media for these three children.
2	Instructional process design for children with special needs	1. Understand the procedure and techniques of instructional process design for children with special needs	1. The instructor asks the learners what difficulties they encountered in completing the instructional media design and what questions they have. Afterwards, the teacher provides a detailed explanation(10min). 2. The instructor presents some incorrect sections from learners' assignment 6, discussed with learners and gives them correctives(30min). 3. The instructor gives a lecture about the content of the instructional process design for children with special needs(10min) 4. The instructor gives a lecture about the procedure and techniques of instructional	Lecture Case study Discussion	Literature: instructional process design; three educational diagnosis reports; slides: instructional process design for children with special needs; life-Chinese or life-math, or life-adaption textbook	Assignment 7 (submit assignments up to QQ group): complete instructional process design of teaching plan 1.	Performance assessment: design the instructional process for these three children

			process design for children with special needs, demonstrates each process of them (30min). 5. The instructor presents incorrect examples of instructional process design, analyzes and discusses with learners(30min).		for special education schools		
2	Instructional process design for children with special needs	1. Master the procedure and techniques of instructional process design for children with special needs	1. The instructor asks the learners what difficulties they encountered in completing the instructional process design and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 7, discussed with learners and gives them correctives(30min). 3. The instructor concludes the considerations in instructional process design(5min). 4. The learners discuss and revise assignment 7, the instructor gives them itinerant guidance (35min).	Discussion Case study	Three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 7 (submit assignments up to QQ group).	Performance assessment: design the instructional process for these three children.
2	Instructional evaluation design for children with special needs	1. Understand the content and procedure of instructional evaluation design for children with special needs	1. The instructor presents some incorrect sections from learners' assignment 7, discussed with learners and gives them correctives(15min). 2. The instructor gives a lecture about the content	Lecture Case study Discussion	Three educational diagnosis reports; slides: instructional	Assignment 8 (submit assignments up to QQ group): complete instructional evaluation	Performance assessment: design instructional evaluation for these three

			and method of the instructional evaluation for children with special needs(10min) 3. The instructor gives a lecture about the procedure of instructional evaluation design for children with special needs and demonstrate each process(35min). 4. The instructor presents incorrect examples of instructional evaluation design, analyzes and discusses with learners(30min).		evaluation design for children with special needs; life-Chinese or life-math, or life-adaption textbook for special education schools	design of teaching plan 1.	children.
2	Instructional evaluation design for children with special needs	1. Master the content and procedure of instructional evaluation design for children with special needs	1. The instructor asks the learners what difficulties they encountered in completing the instructional evaluation design and what questions they have. Afterwards, the teacher provides a detailed explanation(20min). 2. The instructor presents some incorrect sections from learners' assignment 8, discussed with learners and gives them correctives(30min). 3. The instructor concludes the considerations in instructional evaluation design(5min). 4. The learners discuss and revise assignment 8, the instructor gives them itinerant guidance (35min).	Discussion Case study	Three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	Revise assignment 8 and whole teaching plan 1.	Performance assessment: design instructional evaluation for these three children.
2	Design and discussion	1. Understand whole	1. The instructor randomly forms study groups (at	Discussion cooperative	Another three	Assignment 9 (submit	Performance

	of teaching plan 2	instructional design knowledge system in teaching plan 2 design 2. Apply whole instructional design knowledge system in teaching plan 2 design	most 4 persons per group) and informs them group cooperative rules and tasks (5min). 2. The learning groups engages in group discussion about textbooks, children with special needs (children D/E/F) (20min). 3. The learning groups design teaching plan 2, the instructor gives them itinerant guidance(65min).	learning	educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for special education schools	assignments up to QQ group): design teaching plan 2 for another three children.	assessment: design teaching plan 2 for another three children.
2	Implementation of teaching plan 2	1. Understand whole instructional design knowledge system in teaching plan 2 design 2. Apply whole instructional design knowledge system in teaching plan 2 design	1. The learner A implements teaching plan 2(on-site teaching), the learner B and C assist the teaching, the learner D records the video(20min). 2. The learning groups observe the teaching video and record reactions of these children(30min). 3. The learning groups discuss the teaching plan 2 in group, revise teaching plan 2(30min). 4. The learning groups organize on-site teaching materials, including teaching plan 2, slides, teaching video, group discussion record and revised teaching plan 2(10min).	Discussion cooperative learning	A teaching classroom; camera; teaching plan 2	Assignment 10 (submit assignments up to QQ group): on-site teaching materials: teaching plan 2, slides, teaching video, group discussion record and revised teaching plan 2	Performance assessment: organize on-site teaching materials.
2	Discussion and revision of teaching plan 2 (formed teaching plan3)	1. Understand whole instructional design knowledge system in teaching plan 2	1. Each group exchanges and checks on-site teaching materials using the instructional design ability assessment scale (40min). 2.The instructor randomly	Discussion Cooperative learning	Instructional design ability assessment scale; presentati	Assignment 10 (submit assignments up to QQ group): revise teaching plan 2 for another	Performance assessment: design teaching plan 2 for another

		design 2. Apply whole instructional design knowledge system in teaching plan 2 design	selects 2 groups to present their checking results, discusses the presentation with learners (40min). 3. The instructor concludes the consideration of instructional design for children with special needs(10min).		on of checking results	three children.	three children.
2	Implementation of teaching plan 3	1. Understand whole instructional design knowledge system in teaching plan 3 design 2. Apply whole instructional design knowledge system in teaching plan 2 design	1. The Learner B implements teaching plan 2(on-site teaching), the learner A and D assist the teaching, the learner C records the video(20min). 2. The learning groups observe the teaching video and record reactions of these children(30min). 3. The learning groups discuss the teaching plan 3 in group, revise teaching plan 3(30min). 4. The learning groups organize on-site teaching materials, including teaching plan 3, slides, teaching video, group discussion record and revised teaching plan 3(10min).	Discussion Cooperative learning	A teaching classroom; camera; revised teaching plan 2	Assignment 11 (submit assignments up to QQ group): on-site teaching materials: teaching plan 2, slides, teaching video, group discussion record and revised teaching plan 2.	Performance assessment: organize on-site teaching materials.
2	Discussion and revision of teaching plan 3 (formed teaching plan 4)	1. Understand whole instructional design knowledge system in teaching plan 2 design 2. Apply whole instructional design	1. Each group exchanges and checks on-site teaching plan 3 using *Instructional Design Ability Assessment Scale* (40min). 2. The instructor randomly selects 2 groups to present their checking results, discusses the presentation with learners	Discussion Cooperative learning	Instructional design ability assessment scale; presentation of checking results	Revise on-site teaching materials.	Performance assessment: revise on-site teaching materials.

		knowledge system in teaching plan 2 design	(40min). 3. The instructor concludes the consideration of instructional design for children with special needs(10min).				
2	Implementation, discussion and revision of teaching plan 4 (formed teaching plan 5)	1. Understand whole instructional design knowledge system in teaching plan 4 design 2. apply whole instructional design knowledge system in teaching plan 2 design	4. The learner C implements teaching plan 4(on-site teaching), the learner A and D assist the teaching, the learner B records the video(20min). 5. The learning groups observe the teaching video and record reactions of these children(30min). 6. The learning groups discuss the teaching plan 4 in group, revise teaching plan 4(30min). 7. The learning groups organize on-site teaching materials, including teaching plan 4, slides, teaching video, group discussion record and revised teaching plan 4, then design teaching plan 5(10min).	Discussion Cooperative learning	A teaching classroom; camera; revised teaching plan 2	Assignment 12 (submit assignments up to QQ group): on-site teaching materials: teaching plan 2, slides, teaching video, group discussion record and revised teaching plan 2.	Performance assessment: organize on-site teaching materials.
2	Design and discussion of teaching plan 6	1. Integrate whole instructional design knowledge and skills into new practice	1. The learning groups engages in group discussion about textbooks, children with special needs (children G/H/I) (20min). 2. The learning groups design teaching plan 3, the instructor gives them itinerant guidance(70min).	Discussion Cooperative learning	Another three educational diagnosis reports; life-Chinese or life-math, or life-adaption textbook for	Assignment 13 (submit assignments up to QQ group): design teaching plan 3 for another three children.	Performance assessment: design teaching plan 3 for another three children.

					special education schools		
2	Implementation and discussion of teaching 6	1. Integrate whole instructional design knowledge and skills into new practice	1. The learner D implements teaching plan 6(on-site teaching), the learner C and B assist the teaching, the learner A records the video(20min). 2. The learning groups observe the teaching video and record reactions of these children(30min). 3. The learning groups discuss the teaching plan 6 in group, revise teaching plan 6(30min). 4. The learning groups organize on-site teaching materials, including teaching plan 6, slides, teaching video, group discussion record and revised teaching plan 6(10min).	Discussion Cooperative learning	A teaching classroom; camera; teaching plan 3	Assignment 14 (submit assignments up to QQ group): on-site teaching materials: teaching plan 3, slides, teaching video, group discussion record and revised teaching plan 3.	Performance assessment: organize on-site teaching materials.

8. Curriculum materials

The curriculum materials include lecture notes and written materials, a multimedia classroom, slides, 3 diagnostic reports for special needs children, five exemplary lesson plans for children with developmental disorders, five high-quality teaching videos for children with developmental disorders, at least nine special needs children, nine small classrooms for special needs children, one observation classroom for special needs education with a capacity of 55, instructional design ability assessment scale, and special needs children's textbooks (Life Language, Life Mathematics, Life Adaptation).

9. Evaluation in the curriculum

9.1 Performance assessment as the primary evaluation method

Performance assessment is a key method used to evaluate students in this curriculum. It involves observing and assessing learners' completion of tasks or projects in real-world settings to understand their learning outcomes and skill development. Performance assessments provide strong evidence of students' actual performance and allow for the evaluation of specific skills and abilities. These assessments can take various forms, including project evaluations, portfolio assessments, and performance evaluations. In this curriculum, the primary product of instructional design is the lesson plan, which reflects the results of analyzing and designing various elements of instructional design. Situated in authentic and meaningful contexts, lesson plans enable learners to apply their knowledge and skills to solve problems. Therefore, this curriculum uses performance assessment to evaluate learners' academic achievements. Each content block of the lesson plans designed by learners is scored using the "Instructional Design Assessment Scale," and the scores are analyzed to determine learners' progress.

9.2 Combination of diagnostic, formative, and summative assessments

This curriculum combines diagnostic, formative, and summative assessments. Before instruction begins, the instructional design assessment scale is used to evaluate

learners' lesson plans, analyzing their baseline level in instructional design, existing problems, and learning needs, providing a foundation for teaching. During the instructional process, this form is used to evaluate learners' progress, mastery, and any issues within each knowledge module, allowing adjustments to the teaching pace and methods to ensure learners keep up with the course and achieve the expected learning objectives. At the end of the course, the assessment scale is used again to assess learners' learning outcomes and the attainment of curriculum objectives, providing feedback for course design and improvement.

9.3 Combination of self-assessment and peer assessment

During the second and third stages of the curriculum, learners use the instructional design assessment scale to evaluate the lesson plans of other groups, providing comprehensive and objective feedback to help identify issues in their instructional design. Learners also use this form for self-assessment, identifying and discussing problems within their own group's instructional design, thereby enhancing their initiative and engagement. Instructors collect and analyze the combination of self-assessments and peer assessments to understand learners' learning status.

Appendix H The Teaching plan

Unit 2 Analysis of Learners with Special Needs

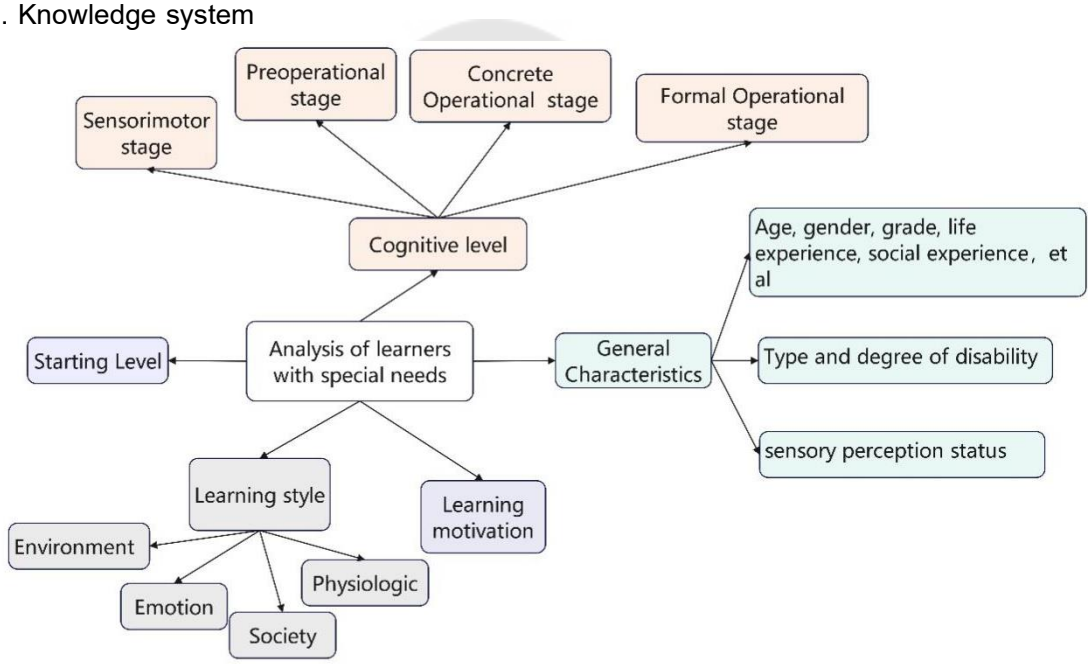
1. Duration

90minutes

2. Objectives:

Master the content and methods for analyzing special needs learners.

3. Knowledge system



4. Content

- Content and methods for analyzing the general characteristics of learners with special needs learners
- Content and methods for analyzing the cognitive level of learners with special needs learners
- Content and methods for analyzing the starting level of learners with special needs learners
- Content and methods for analyzing the learning styles of learners with special needs learners
- Content and methods for analyzing the learning motivations of learners with special needs learners

5. Teaching resource

Slide, 3 learning videos about the learners with special needs, 3 assessment reports for children with special needs, and instructional design assessment scale (the section of *Analysis of learners with special needs*).

6. Instructional process

- Warm-up activities

The instructor displays a slide featuring images of beads and poses questions: "If you were to teach bead stringing to a 5-year-old child, what beads would you choose as teaching materials? What if the child were a 5-year-old boy? What if it were a 5-year-old girl? What about an 18-year-old girl? An 18-year-old boy?" After the learners respond, the instructor prompts them to reflect on their choices: "Now think about the beads you just selected. What do you notice?" Following the learners' observations, the instructor concludes, "When learners vary, the instructor's choice of teaching materials also varies! Therefore, what steps should teachers take before instructing learners with special needs to ensure that the selected teaching materials are more suitable for them? That's today's topic: Analysis of Special Needs Learners." Subsequently, the instructor presents the first and second slides of the PowerPoint, informing the learners about the upcoming content they will be studying.

- **Content and methods for analyzing the general characteristics of learners with special needs** learners

The instructor elucidates the content and methodologies for analyzing the general characteristics of special needs learners using a PowerPoint presentation. Subsequently, the instructor screens a video featuring a disabled child engaged in learning activities, prompting learners to observe any sensory perception issues and discuss their implications:

The instructor prompts the learners to discuss the impact of sensory perception issues on learning for the disabled child, and subsequently emphasizes the importance of analyzing sensory perception for learners with special needs. Afterward, the instructor utilizes the three assessment reports of disabled children distributed before class to demonstrate the process of analyzing the general characteristics of learners with special needs.

- **Content and methods for analyzing the cognitive level of learners with special needs learners**

The instructor explains the content and methods of analyzing the cognitive level of special needs learners with the help of a slide. Additionally, the instructor demonstrates the process of analyzing the cognitive level of learners with special needs, using the three assessment reports of disabled children distributed earlier.

- **Content and methods for analyzing the starting level of learners with special needs learners**

The instructor presents the slide, elucidating the significance, content, and methods involved in analyzing the starting level for learners with special needs. Additionally, the instructor provides a live demonstration of analyzing the starting level of special needs learners, utilizing the three assessment reports of disabled children distributed earlier.

- **Content and methods for analyzing the learning styles of learners with special needs learners**

The instructor shows the slide:

Then the instructor explains the meaning of learning styles, the categories (environmental, emotional, social, physiological), and provides detailed explanations of the specific content and analysis methods for each item within each category.

Additionally, the instructor plays a learning video of a disabled child in class:

The learners are prompted to analyze the learning style of the child and engage in on-the-spot discussion. Following the discussion, the instructor integrates the three assessment reports of disabled children distributed prior to the class and illustrates the process of analyzing the learning styles of learners with special needs based on these assessment reports.

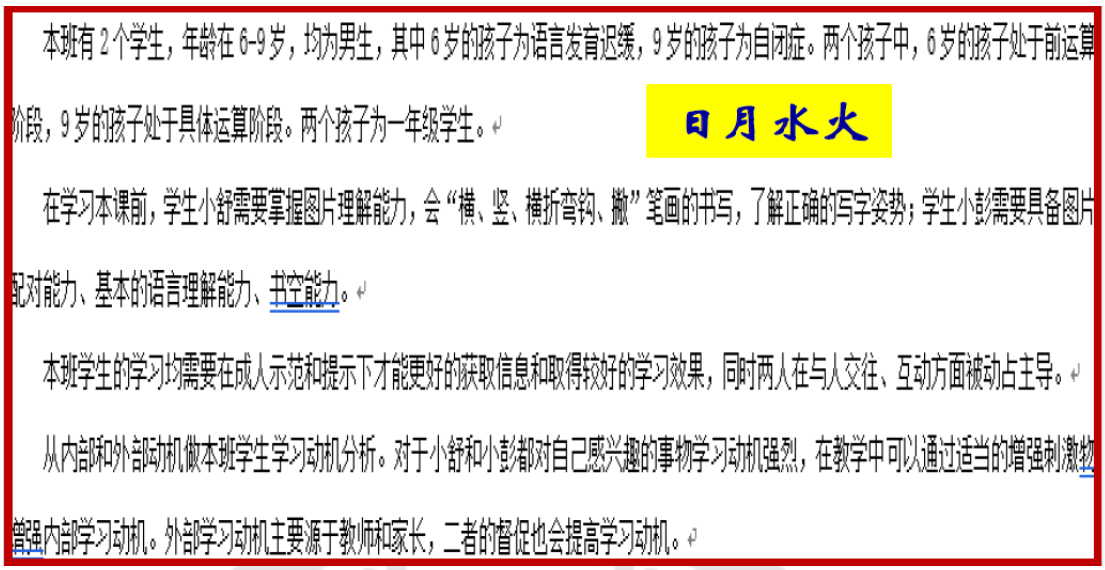
- **Content and methods for analyzing the learning motivations of learners with special needs learners**

The instructor integrates the slide presentation to elucidate the concept of learning motivation and methods of assessment. Subsequently, the instructor screens a classroom teaching video featuring disabled children.

Following that, the instructor conducts a live demonstration of assessing learning motivation and facilitates a discussion. After the discussion, the instructor amalgamates the three assessment reports of disabled children distributed prior to the class and showcases the process of analyzing the learning motivation of special needs learners based on the assessment reports.

- **Integrated discussion**

The instructor presents the analysis of special needs learners' assignment in the slide.


本班有2个学生，年龄在6-9岁，均为男生，其中6岁的孩子为语言发育迟缓，9岁的孩子为自闭症。两个孩子中，6岁的孩子处于前运算阶段，9岁的孩子处于具体运算阶段。两个孩子为一年级学生。

在学习本课前，学生小舒需要掌握图片理解能力，会“横、竖、横折弯钩、撇”笔画的书写，了解正确的写字姿势；学生小彭需要具备图片配对能力、基本的语言理解能力、书空能力。

本班学生的学习均需要在成人示范和提示下才能更好的获取信息和取得较好的学习效果，同时两人在与人交往、互动方面被动占主导。

从内部和外部动机做本班学生学习动机分析。对于小舒和小彭都对自己感兴趣的事物学习动机强烈，在教学中可以通过适当的增强刺激物增强内部学习动机。外部学习动机主要源于教师和家长，二者的督促也会提高学习动机。

Then, the instructor prompts the learners to discuss and analyze the accuracy and errors of the materials presented using the knowledge gained in this lecture. After the discussion, the instructor randomly selects a learner to share the results of the discussion, followed by engaging in an on-the-spot discussion based on the learner's sharing: "Is the result accurate? Why or why not? How did you arrive at your conclusion?"

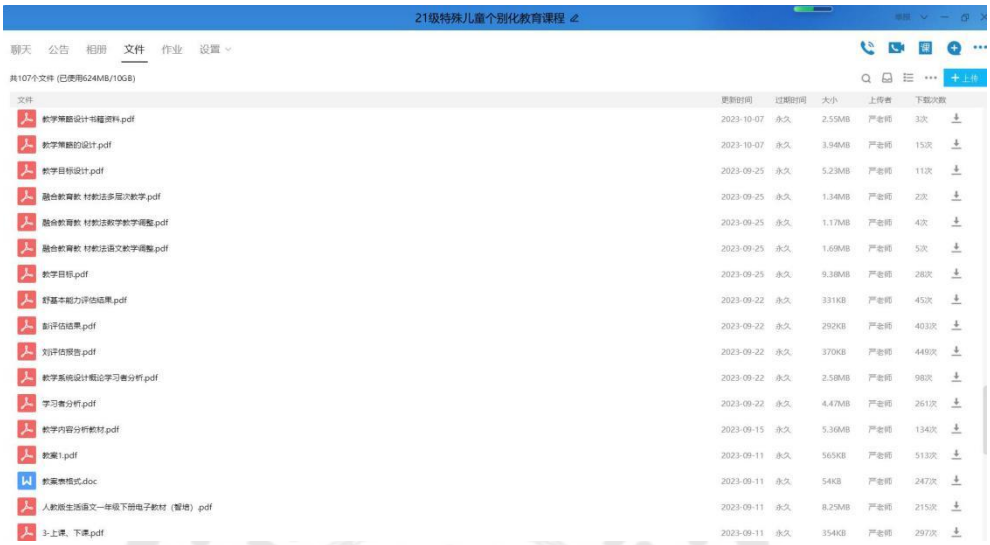
- Summary for unit 2

After the on-site sharing and discussion, the instructor summarizes the content and key points of analyzing special needs learners, and assigns homework tasks for practice after class.

7. Learning achievements evaluation

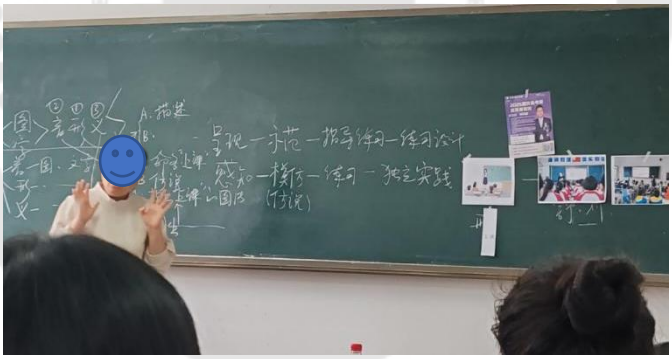
Objective	Evaluation method	Evaluation tools	Information resource	Passed standard
Master the content and methods for analyzing special needs learners.	Performance assessment	instructional design assessment scale (the section *of Analysis of learners with special needs).*	The learners	Less than one error item.

Appendix I Curriculum implementation



Curriculum materials online

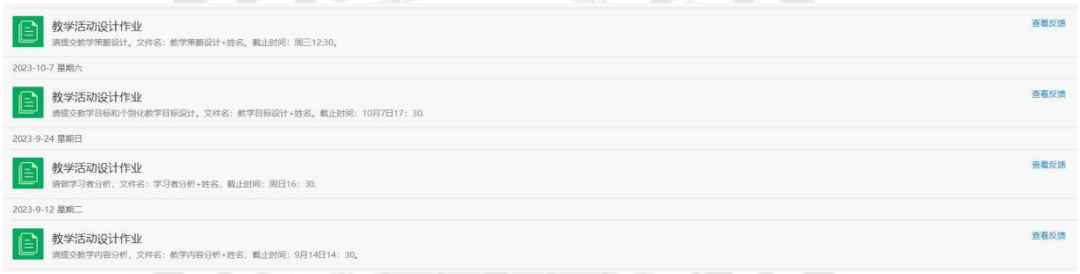
Stage 1 knowledge translation



The lecture

The slide

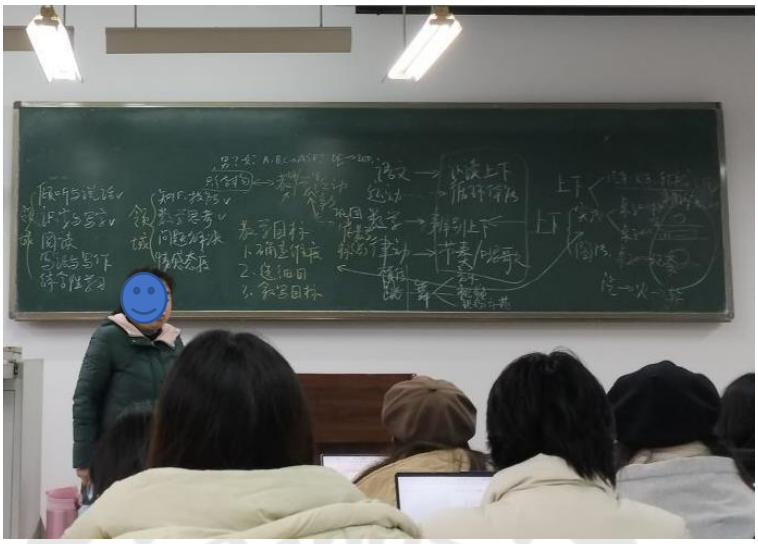
Learners' note



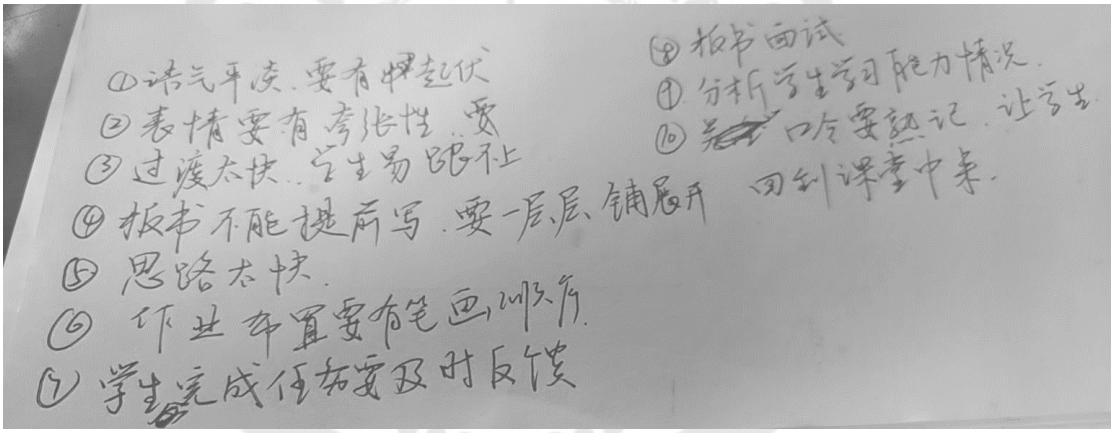
Coursework

Feedbacks

Stage 2 skill aggregation



Lecture



Learners' note

Coursework

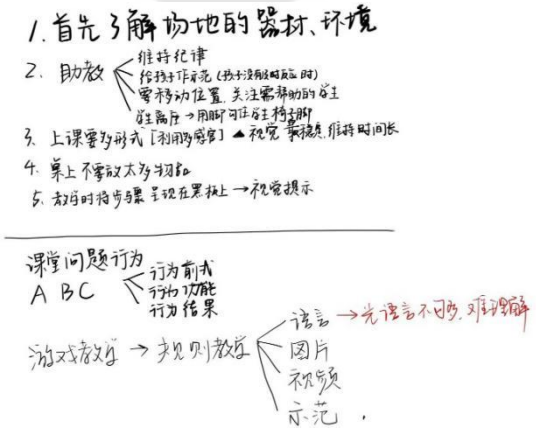
Feedback

Group discussion

On-site teaching

On-site guidance

Stage 3 practice integration



Learners' note

Feedback

Group discussion

On-site teaching

On-site guidance

VITA