

# A Study on Curriculum Development of Interdisciplinary Pedagogical Knowledge for Elementary School Generalist Teachers: A Case Study

Zhaodan Nie

Institute of Education, Yunnan College of Business Management, Kunming, China

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**Abstract:** The core literacy-oriented basic education reform requires students to have the ability to cope with complex problems. Accordingly, elementary generalist teachers, who are positioned as excellent teachers, need to possess interdisciplinary pedagogical knowledge. The components of interdisciplinary pedagogical knowledge for primary generalist teachers include interdisciplinary content knowledge (interdisciplinary pedagogical orientation knowledge, interdisciplinary pedagogical context knowledge, and knowledge about student understanding) and interdisciplinary pedagogical knowledge (interdisciplinary pedagogical strategies knowledge, and interdisciplinary pedagogical evaluation knowledge). The analysis of the pre-service training program was conducted in School Y in southwestern China.

## 1. Introduction

With the needs of social development, the United States and other Western countries were the first to develop the cultivation of elementary school generalist teachers. The United States requires elementary educators to receive cultivating and training content in all subjects of elementary education[1]. Primary teacher training in countries such as the United Kingdom, France, Finland, and Germany also implements a whole-subject education and is not only formally able to teach multiple subjects, but is truly competent in the sense of being able to integrate the content of multiple subjects and implement interdisciplinary teaching processes. In China, since 2012, the state has promulgated a series of documents, including the *Opinions on Deepening Teacher Education Reform*, which propose to cultivate excellent elementary school teachers with broad knowledge and capable of teaching multiple subjects in elementary school. The concept of interdisciplinary teaching was first introduced in Germany and refers to the process of integrating and teaching a common theme using knowledge from multiple disciplines by selecting and focusing on a central theme with a particular discipline as the centerpiece[2]. Primary generalist teacher preparation is an international trend in teacher education reform, and Mansilla[3] argues that through interdisciplinary teaching, students develop and refine their skills such as synthesis, transfer, critical thinking, creative thinking, and making complex thinking visible. Frodeman and Rowland [4] argue that in the context of interdisciplinary teaching, students' metacognitive abilities can be fully mobilized to notice their learning strategies and to think about how to solve problems, which breaks down disciplinary boundaries to some extent. Tomlinson et al[5]. argue that having an interdisciplinary school-based curriculum helps students build breadth of knowledge and form connections between ideas. Therefore, it is important to study the curriculum at the pre-service teacher preparation stage.

## 2. Components of Interdisciplinary Teaching Knowledge for Elementary School Generalist Teachers

In 1986, Schulman [6] asked the following questions: Where do teachers get their explanations? How do teachers decide what to teach? How do teachers represent subject knowledge? How do teachers ask questions of students and how do they deal with misunderstandings? prompts educators to think about the sources of teacher knowledge and the composition and development of teacher

knowledge. In the area of interdisciplinary pedagogical knowledge needed by primary generalist teachers, Nissani [7] proposes from the concept of curriculum integration that interdisciplinary teaching should be determined by the number of disciplines involved, the conceptual and methodological distance between disciplines, the novelty of the combination of disciplines, and the degree of integration. Closely related to the interdisciplinary pedagogical knowledge required of the generalist teacher are two concepts: disciplinary pedagogical knowledge (PCK) and interdisciplinary pedagogical content knowledge (IPCK). According to Schulman's definition PCK refers to the integration of the teacher's personal pedagogical experience, the teacher's disciplinary content knowledge, and pedagogy. According to An's theory[8], PCK based on the interaction between multiple disciplines is called IPCK. As shown in Figure 1, the IPCK framework has three basic knowledge categories: pedagogical knowledge (PK), content knowledge of Discipline A (CK-A), and content knowledge of Discipline B (CK-B). The overlap of the three knowledge categories leads to the emergence of four additional categories: pedagogical content knowledge of Discipline A and Discipline B (PCK-A and PCK-B), interdisciplinary content knowledge (ICK), and interdisciplinary pedagogical content knowledge (IPCK).

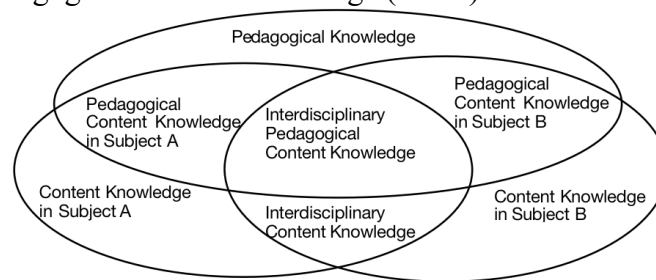


Fig.1 Ipck Framework

However, yet, true interdisciplinary pedagogical knowledge is not fully defined and remains largely subordinate to one discipline in terms of knowledge itself. The interdisciplinary pedagogical knowledge of elementary school teachers discussed here is more focused on a practical knowledge of the connections between disciplinary knowledge. Specifically, it includes two kinds of knowledge elements: (1) interdisciplinary content knowledge, which refers to teachers' interdisciplinary knowledge reserves, such as humanities, social sciences and natural sciences, in addition to understanding and grasping the content knowledge of their own subjects. This includes: 1) knowledge of interdisciplinary teaching orientation (the connotation of interdisciplinary teaching, the value of interdisciplinary teaching); 2) knowledge of interdisciplinary teaching situations (the creation of problem situations, the exploration of resources and tools); 3) knowledge about students' understanding (the understanding of prior knowledge and experience, the understanding of learning difficulties). (2) Knowledge of interdisciplinary pedagogy refers to teachers' methodological knowledge of interdisciplinary teaching, such as knowledge about methods such as thematic, problem-based, and project-based pedagogy. This includes: 1) knowledge of interdisciplinary teaching strategies (integration of interdisciplinary content knowledge, implementation of interdisciplinary teaching activities, selection of interdisciplinary teaching methods, construction of interdisciplinary teaching scaffolds); 2) knowledge of interdisciplinary teaching evaluation (content of interdisciplinary teaching evaluation, interdisciplinary teaching evaluation methods).

### 3. Overview Review of Curriculum Development for Elementary School Generalist Teacher Training

Curriculum development for elementary school generalist teacher training refers to the process of setting curriculum goals, organizing curriculum content, structuring the curriculum system, and implementing and evaluating the curriculum based on the school's educational objectives and training goals in accordance with the guidance of national education policies and the needs of social practices. This paper selects a school Y, which is in the southwestern region of China to train elementary school generalist teachers, as a case study, and analyzes its profile in the development of

interdisciplinary teaching knowledge of elementary school generalist teachers through the basic curriculum of the school.

### 3.1 Training Objectives

The objectives set by school Y for the training of elementary school generalist teachers involve teaching knowledge objectives: to have a certain degree of humanistic, social and natural science literacy and to form a relatively broad base of general knowledge. Master the basic knowledge, basic principles and basic skills of the elementary school language or mathematics subject and have the ability to solve the basic problems of the subject. Master the basic knowledge, basic principles and basic skills of auxiliary education subjects. Understand the basic knowledge of other disciplines such as music, art, and labor information technology. Possess the initial ability of discipline integration and knowledge fusion.

### 3.2 Course Structure

We have built a curriculum system of general knowledge + major, compulsory + elective, covering three types of courses: teacher education, subject specialization education, and concentrated practice, and a curriculum teaching system and skill training system of one major, one minor and one speciality. One main is the student's main subject direction, language or mathematics. One minor is the student's minor subject direction, humanities and society or science and labor technology. One specialty means that from the second semester, each student takes one module from eight individual specialty modules of dance, vocal music, instrumental music, calligraphy, painting, arts and crafts, language arts, and physical education and health to develop an artistic or sports specialty according to his or her personal reality.

Table 1 Curriculum Structure Of Elementary School Generalist Teacher Training in School y

Course Platform	Course Category		Credit Ratio
General Studies Platform	General Studies Required Courses		30.62%
	General Education Elective		
Professional Education Platform	Teacher Education Courses	Required Teacher Education	25.00%
		Teacher Education Elective	
	Subject specialization courses	Required for academic majors	35.00%
		Subject Major Elective	
	Professional concentration practice	Professional skills assessment for teachers	9.38%
		Education Apprenticeship	
		Education Study	
Education Internship			
Thesis (Design)			
Total			100%

The main subjects (professional foundation) set by the school Y are education, psychology, Chinese language and literature, and mathematics. The core courses are elementary education, elementary psychology, advanced mathematics, modern Chinese, writing, elementary mathematics fundamentals, elementary Chinese language/math curriculum and teaching, and children's literature (See Table 1).

### 3.3 Curriculum of Educational Practice

The school Y has established a four-dimensional cultivation path that is led by curriculum, practice, community outreach, and cultural internalization. The curriculum and main practice programs for elementary school teachers as follows: Introduction to the elementary education profession; Writing skills; Oral language for teachers; Foundations of fine arts; Foundations of music; Elementary Chinese language/mathematics curriculum and instruction; Modern educational technology; Subject orientation courses for primary & secondary teachers; Individual specialties module courses; Professional skills assessment for teachers; Educational apprenticeship/research.

Educational internship; Graduation thesis (design).

#### 4. Deficiencies in the Development of Interdisciplinary Teaching Knowledge of Elementary School Generalist Teachers

##### 4.1 Insufficient Specificity of Interdisciplinary Teaching Knowledge Requirements in the Training Objectives

Although there are educational requirements for interdisciplinary teaching knowledge in the training objectives of School Y, they are too broad and are not reflected in the specific course objectives or in the quality of knowledge and abilities examined for graduation. The graduation requirements are expressed in eight aspects, including the code of teacher ethics. As shown in Table 2.

Table 2 School y Program Support Graduation Requirements Matrix (Partial)\*

Course Category	Course Name	Course Nature	Lesson time	Graduation Requirements							
				Code of Ethics for Teachers	Educational Sentiment	Academic Literacy	Teaching ability	Class Guidance	Integrated Education	Learn to reflect	Communication and Cooperation
Subject Specialization	Introduction to Elementary Education Major	Required	14	M	H	L	L	L	L	L	L

\*L, M, H indicate the degree of support for graduation requirements, L is Low, M is Medium, H is High.

So, we see that the interdisciplinary pedagogical knowledge goals mentioned in the training curriculum objectives are really penetrated through the curriculum education still disciplinary training ideas. Although the number of disciplinary specializations is increased within the same training academic system, it does not fully achieve higher disciplinary quality requirements, which is contrary to the scientific curriculum construction, because the resulting generalist teachers still have a fragmented disciplinary background, and the interdisciplinary pedagogical knowledge training goals lack a specific and clear index system to measure and evaluate the degree of final achievement of the training goals.

##### 4.2 Blurred Disciplinary Boundaries, Not Reflecting the Ability to Integrate Interdisciplinary Teaching Knowledge

First, the lack of integration and connection between courses hinders the development of comprehensive knowledge structures and interdisciplinary teaching knowledge. From the overall situation of curriculum setting, each module and each subject course of various courses run according to their own disciplinary logic system, and there is a lack of connection and communication. Secondly, from the specific situation of each module, the general education courses focus more on ideology and politics, and there is a relative lack of humanities and social science courses, the curriculum area is not broad enough, the knowledge structure lacks breadth, and it is difficult to form a comprehensive knowledge system; the disciplinary foundation courses attach great importance to the longitudinal development of disciplinary content, ignore the horizontal association between different disciplines, and the courses lack internal connection. Once again, from the perspective of the type of courses offered, the curriculum of elementary school general education teachers is mainly based on sub-disciplinary teaching, more subject-based courses, lack of comprehensive courses, open courses, shortage of inquiry and activity-based courses, which easily lead to the fragmentation of learned knowledge and difficulty in integration and coherence.

##### 4.3 Educational Practice Sessions Do Not Have Clear Requirements for Interdisciplinary Teaching Knowledge Practice

At present, the educational practice link in school Y has not mentioned the specific implementation methods of the practice courses, such as the arrangement of the content of practice, the selection of practice methods, the final assessment methods of practice and the guaranteed measures. The different educational practice forms of educational internship, practicum and thesis do not emphasize the generation of interdisciplinary teaching knowledge and lack the progressiveness of content. There are few practical teaching courses, low allocation of credit hours

and credits, insufficient attention to in-class practical teaching, and lack of teaching skills courses. The lack of courses in teaching skills has led to little success in relying solely on educational internships and practicums to train teachers' skills. In addition, the training of elementary school teachers is semi-closed, which makes students easily detached from the actual educational scene, relying only on teachers' scenarios or their own school experience to imagine, and lacking an understanding of the overall state of elementary school education.

## **5. Optimization Strategies for Curriculum Development of Elementary School Generalist Teachers**

### **5.1 Clear Training Objectives**

In terms of training objectives, the expression of interdisciplinary teaching knowledge in the stage-specific training objectives should be refined, not only to enhance the breadth of knowledge and generate a broad knowledge structure through general education courses, but also to acquire interdisciplinary teaching knowledge and consolidate interdisciplinary teaching knowledge through disciplinary professional competence and vocational skills. In addition, it highlights generalism and excellence, with generalism emphasizing the ability of the main teacher to cross borders between disciplines and integrate curriculum content. On the other hand, highlights the outstanding character that teachers have in terms of educational ideals, emotions, knowledge and ability, beliefs, and will. Therefore, the requirement of interdisciplinary teaching knowledge for teachers needs to be not only reflected in the training objectives, but also linked to the specific graduation requirements through each course one by one, and the requirement of interdisciplinary teaching knowledge is refined in the graduation requirements and the degree of support of each course is emphasized in order to truly put the cultivation of interdisciplinary teaching knowledge into practice.

### **5.2 Optimize Course Content**

The interdisciplinary teaching knowledge of elementary school whole-subject teachers presents characteristics of interdisciplinarity, contextuality, and dynamism. It is necessary to integrate course content according to the theory of curriculum integration and improve the comprehensiveness of course content in order to equip teachers with an integrated knowledge system and educational teaching ability. Although the discipline-based sub-disciplinary training modules design course contents according to the training requirements of multidisciplinary teaching, and students seem to master the knowledge structure of multiple disciplines, students lack the ability to teach across disciplines and integrate course contents, because the knowledge they acquire is still fragmented and scattered. The internal logic and coherence of the disciplines themselves remain in a position of importance compared to the integration between disciplines. In interdisciplinary teaching, teachers should not only guide students to acquire knowledge and content from two and more disciplines, but also focus on the cultivation of generic skills such as cooperation and communication. Therefore, curriculum content integration should be based on curriculum clusters, i.e., organizing related courses according to a certain logic around the core curriculum, and forming a community of curriculum research teachers who focus on conducting curriculum integration, considering curriculum content and selecting teaching materials.

### **5.3 Enrichment of Course Implementation Methods**

Avoid the filler teaching mainly taught by teachers, and flexibly adopt various teaching modes such as micro-lessons, catechism, micro-grid teaching, case teaching, lecture and evaluation, special lectures, field trips, etc., to encourage students to actively participate in the classroom and gain rich interdisciplinary teaching knowledge, while guiding students to form learning communities, carry out group learning, brainstorming, discussions and debates, practical training, visits and demonstrations, handing over buildings Sharing and other learning activities. We strengthen the training of classroom teachers and administrators, broaden the training channels, encourage classroom teachers to participate in academic activities in teacher education and related disciplines,

and support classroom teachers to go deeper into practice bases, grassroots elementary school for study and exchange and front-line elementary school teachers to enter university classrooms, etc., so as to master interdisciplinary teaching knowledge through in-depth understanding of the actual teaching process of each discipline.

#### **5.4 Establishing a Course Evaluation System**

Establish a scientific, diversified, and operable curriculum evaluation system. In the subject of curriculum evaluation change the teacher to student evaluation as the main way to implement the effectiveness of other subjects such as students, curriculum experts, curriculum managers, curriculum implementers, front-line elementary educators, parents, etc. to participate in the evaluation of the curriculum. In terms of curriculum evaluation content, the concept of curriculum evaluation should be focused on students and their existential attributes and should be evaluated by setting up a specific and operable interdisciplinary teaching knowledge measurement system, providing reference for different types of interdisciplinary teaching knowledge evaluation through a better index system, giving corresponding weights, etc. to enhance the scientific nature of evaluation. The evaluation methods should be selected according to specific course contents, such as teaching design, lecture presentation, report writing, practical skills test, comprehensive quality test, etc., focusing on examining the degree of mastery of interdisciplinary teaching knowledge from practice.

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#### **References**

- [1] Christopher J. Lucas. *Teacher Education in American: Reform Agendas for the Twenty-First Century* [M]. New York: St. Martin's Press, 1997: 203.
- [2] Huijie Du, Schulz. Analysis of interdisciplinary teaching philosophy and instructional design in Germany[J]. *Global Education Perspectives*,2005,34(08):28-32.
- [3] Mansilla V B. *MYP guide to interdisciplinary teaching and learning* [J]. Cardiff: International Baccalaureate, 2010.
- [4] Frodeman R, Rowland J. De-disciplining the humanities[J]. *Alif: Journal of Comparative Poetics*, 2009, 29: 62-72.
- [5] Tomlinson C A, Kaplan S N, Renzulli J S, et al. *The parallel curriculum: a design to develop learner potential and challenge advanced learners*[M]. Corwin Press, 2008.
- [6] Shulman L S. Those who understand: Knowledge growth in teaching[J]. *Educational researcher*, 1986, 15(2): 4-14.
- [7] Nissani M. Fruits, salads, and smoothies: A working definition of interdisciplinarity[J]. *The Journal of Educational Thought*, 1995: 121-128.
- [8] An S A. Preservice teachers' knowledge of interdisciplinary pedagogy: the case of elementary mathematics-science integrated lessons[J]. *ZDM*, 2017, 49(2): 237-248.