



Research Article

FACTORS AFFECTING LEARNING PEDAGOGICAL CONTENT KNOWLEDGE OF STUDENTS MAJORING IN GEOGRAPHY TEACHER EDUCATION

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ABSTRACT

This paper analyzes the factors affecting the formation and development of PCK of Geography student teachers. Based on the PCK model (Pedagogical Content Knowledge) and the PCK model of Geography teachers, we build the theoretical model and explain factors affecting students' learning of the geographic pedagogical knowledge. Qualitative research was applied in this study with theory review, expert consultation, micro-teaching, practical teaching experience summary. Results from this study have pointed out that students' experience is related to geography, Geography students gain knowledge from general education, and curriculum are the main factors forming the PCK of geography student teachers

Keywords: Geographic pedagogical knowledge, Geography student teachers; Pedagogical content knowledge

1. Introduction

Pedagogical Content Knowledge (PCK) is a special combination of content and pedagogy. This type of knowledge is only available in teachers (Shulman, 1987), or is the knowledge that distinguishes between the knowledge of experts and educators in a certain field (Gess-Newsome, 1999). Thus, a teacher in general and a geography teacher in particular need to have three types of knowledge: Content Knowledge (CK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK). PCK is a special amalgam of content knowledge and pedagogical methods. It is the knowledge of profession combined with the skills of using, adjusting, and creating teaching activities, approaches to help students learn better.

Geographic pedagogical knowledge is the combination between geographic knowledge and pedagogical knowledge in Geography teachers. The interference between different fields of knowledge, geographic skills, and pedagogical knowledge will create

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different teaching methods. PCK-G is unique for geography teachers. It is a type of knowledge that integrates geographical knowledge and pedagogical knowledge to teach geography (Cochrane, 1991). It is necessary to clarify three aspects to understand the structure of PCK- G: (1) What geography teachers will teach (subject knowledge): geographic knowledge, learning skills, and motivation, (2) How geography teachers will teach (methodological knowledge): teaching skills to help students learn geography, and (3) Why do geography teachers teach it this way (belief in the subject). It helps students become responsible and active global citizens (Figure 1) (Blankman, Van Der Schee, Volman, & Boogaard, 2015).

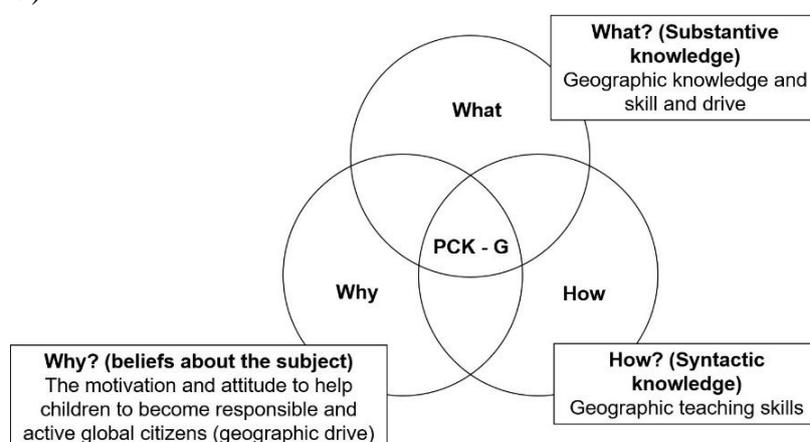


Figure 1. PCK for the subject of Geography (Blankman et al., 2015)

Shulman (1986) initiated the PCK model in teacher training. This model then attracted a lot of interest and centrally researched the application of PCK to the fields of training teachers specialized in Physics and Chemistry. In training Geography teachers, the study conducted by Arenas-Martija et al. (2017) entitled “Fragility of Pedagogical Content Knowledge in Geography” is a case study on factors affecting the sustainability of the PCK of a group of Geography teachers (Arenas-Martia et al., 2017). Martin pointed out the factors affecting the PCK of beginning elementary geography teachers in research on Knowledge for effective teaching. The primary geography teachers’ PCK is a combination of geographical subject knowledge and pedagogical knowledge. Therefore, the factors that affect PCK are also the factors that affect each of its components (Martin, 2008). Hong and his colleagues introduced the Conceptual Model of the Knowledge Base for Geography (GeoKBT) including six components: Orientations toward teaching geography; knowledge of geography curricula; knowledge of students' understanding of geography and responses to geography learning; knowledge of instructional strategies appropriate for geography; knowledge of assessment of geography learning; and knowledge of educational contexts (Hong et al., 2018).

The relationship between the teaching of content knowledge and methodological knowledge is an area that many geographic educators in Vietnam have studied. A typical

example is the research of Nguyen Viet Thinh and Do Thi Minh Duc entitled "The role of lecturers and departments in teaching basic science to develop pedagogical competence for Geography student teachers." This study analyzed and oriented the role of basic science subjects in developing competences for Geography student teachers (Nguyen, 2016).

The author of this paper also discussed the approaches to determine PCK for geography student teachers in a study in 2020. The PCK model and PCK for Geography teachers (PCK-G) were applied to build the structure of Internal Pedagogical Geography Knowledge of Geography student teachers (PGK-ST). PCK-ST includes Geography teaching orientations, Geography education curriculum knowledge, knowledge of students' geographic understanding, Geography teaching strategies knowledge, and knowledge of assessment in teaching geography (Ha, 2020).

The goal of this study is to analyze the factors that form the PCK of Geography student teachers. On that basis, there is an approach in training Geography student teachers, especially teaching theoretical courses and teaching methods. The results of this study can be used as a reference for designing curriculum, application of teaching methods that can help students develop competences for Geography student teachers at institutions of higher education.

2. Participants and research methods

The focus of this study is factors that help to form the PCK for Geography student teachers including knowledge from Geography teacher education training program; School experiences as a pedagogical student; School experiences as a student; and Life experiences related to geography (Figure 1). The studies were conducted on junior and senior Geography student teachers in universities that have teacher education curriculum.

The author used the results of Shulman's research on the PCK and affecting factors on PCK of Martin's as the theoretical foundation to analyze PCK and PCK affecting factors of Geography student teachers. The theoretical models are restructured to analyze the factors affecting the PCK of Geography student teachers. Then, the factors affecting the PCK model of geography student-teachers were consulted by the nation's leading geography education experts. This step is to adjust the model so that it is more reasonable based on their feedbacks.

Martin in research on Knowledge Bases for Effective Teaching: Beginning Teachers' Development As Teachers of Primary Geography has pointed out factors that affect geographic knowledge and pedagogical knowledge; thereby affecting the PCK of Geography teachers (Martin, 2008). For geographic knowledge: knowledge equipped in school, experience at school as a student studying Geography, and life experience related to Geography are direct factors. In addition, the pedagogical knowledge that Geography teachers obtain through training courses, school experience as a learner, and experience in the school as a teacher. For students trained to become a Geography teacher, the factors that affect the PCK have a few differences. Experience as a teacher at school has been replaced by experiences of pedagogical students in factors affecting pedagogical knowledge.

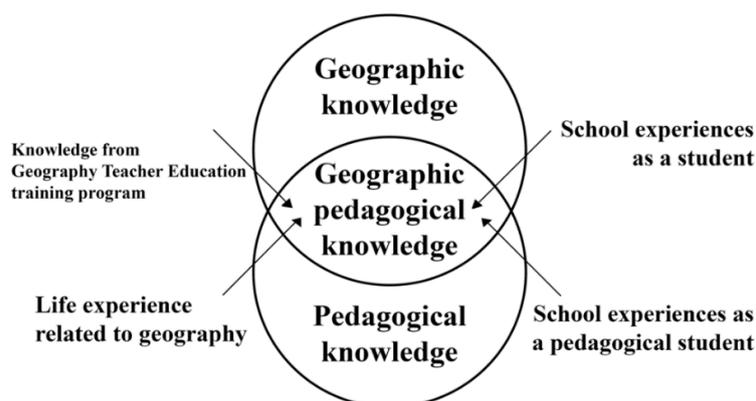


Figure 2. Factors affecting Geography student teachers' PCK

To answer the research question: How do the factors affect PCK of Geography student teachers? The author used the results in previous studies and summarized the teaching experience of the Geography teaching methods courses.

The data collected on micro-teaching methods in the development of geography teaching skills are used to analyze the ability of students to apply knowledge and skills to specific teaching situations, and the mistakes students often make. Observation method is the main tool in the micro-teaching method.

The author also analyzed the curriculums designed for geography student-teachers of five institutions in the Southeast and the Mekong Delta to analyze the impact of curriculum elements for Students' PCK-G. The analysis focuses on the structure of knowledge blocks including general knowledge, geography majors, education, and pedagogical geography knowledge. Then, the data were combined with the competency tests and data collected on micro-teaching for discussion related to students' application of knowledge and skills. The competency test is a test of general geography knowledge and skills and geography teaching skills conducted at the beginning course for seniors. The question items were designed according to three levels: knowing, understanding, and applying knowledge and skills.

Besides, a number of experiments on teaching methods are used to demonstrate the impact of learners' experiences and experiences at high schools on the formation of PCK-G.

3. Results and discussion

3.1. School experience as students

Upon admission, pedagogical students bring with them the experiences of high school students. In other words, before becoming a teacher, every pedagogical student was a student. These experiences have a two-way effect on the formation and development of PCK.

The geographic knowledge and skills equipped in high schools create a foundation for students to acquire geographic content knowledge at the university degree. Geography in high schools and geography majors trained in professional schools are basically similar in nature of geosciences in the structure, the approach, methodology, and research methods, despite the difference in purposes.

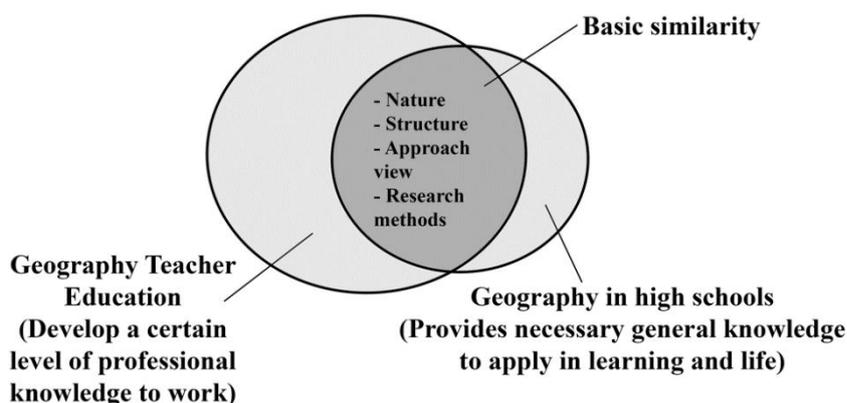


Figure 3. Relationship between Geography and geography majors in university

In another respect, as a student, learners experience the ways to acquire knowledge and form geographic skills. Once they become a Geography teacher, this factor is vital because they must put themselves in the role of students to understand the knowledge and the difficulties students face. In other words, as teachers, they will "metacognition" their own learning process to understand that of learners. However, it sometimes creates contradictions between the approach to Geography and the majors of Geography taught at the university level. The method of learning Geography is different from the approach and method of studying Geography majors. Intangibly, it becomes a limitation to the acquisition and development of content knowledge. To illustrate this point, we interviewed teachers teaching freshmen, most of whom said, "Most freshmen have difficulties with learning methods when switching from studying in high school to university. The most in-depth knowledge block is the problems related to natural sciences and mathematics which are the limitations for Geography freshmen."

The role models and teaching styles of teachers in general and Geography teachers in particular that they learn from will form part of the teaching style when they become teachers. From here, a contradiction appears in the student. On the one hand, it is the role model that they consider as the standard of general teachers and on the other hand, the model of modern teachers shaped in university. Their task is to resolve that conflict to build their teaching style.

3.2. *The student's life experience related to geography*

Geographic knowledge is close and attached to the student's life and is increasingly "full". This is a valuable "resource" for the professional development of Geography students and teachers. Experimental knowledge is the basis for learners to better understand theoretical knowledge, whereas theoretical knowledge "illuminates" empirical knowledge by providing an approach to enrich the available amount of knowledge. A small trial was conducted in senior Geography student teachers to verify the above statement. The students were divided into two groups: group 1 with students from the North and North Central, and

group 2 with students from the South, South Central, and Central Highlands. They were asked to answer the same questions. In the first question: "Please explain the characteristics of late winter weather in our country's Northern area." The students in the two groups all explained correctly. In the second question: *Why the cold at the end of winter in our country is called Nang Ban cold. Please describe the weather characteristics when there is Nang Ban cold.* In this regard, the advantage belongs to the group of students from the North and the North Central region because the percentage of students who answered correctly is more than that of students from the south and South-central region. There are 13.6% of students in the southern student group who cannot explain this phenomenon, "partially explain" and "explain not clearly" at 54.5% and 31.8% respectively. In contrast, 50% of the northern students correctly explained the phenomenon, and the rest partially explained it. If this experiment was to be applied to a phenomenon exclusive to the South, the results would certainly be the opposite. Thus, experience is a factor that needs to be mobilized to create knowledge for learners and experience will help them connect theoretical knowledge with reality. Obviously, the students in the South need to experience Nang Ban cold to be able to "colorfully" teach this phenomenon to students. In training Geography teachers based on field research, experiential learning plays a very important role.

However, the "transformation" of knowledge and experience of pedagogical students into knowledge for teaching has faced obstacles. When Martin analyzes the factors that affect students in Elementary Geography Education in the early stages of their careers, he points out that, The Geography teacher's perspective on teaching planning and evaluating their students is influenced by the geographic knowledge they are formally trained in school and the knowledge and experience they acquire daily. In which, experiential knowledge is often hindered in this process for the following reasons: *First*, formal learning experience receives higher acknowledgment than an informal learning experience in the views of teachers as well as of education. *Second*, learners perceive their role as a teacher than as a student. That is why empirical geography knowledge will reduce its role for the Geography teacher (Figure 4) (Martin, 2008).

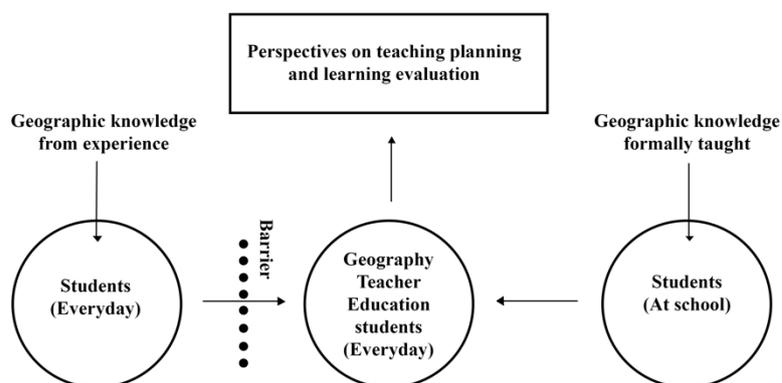


Figure 4. Diagram showing the factors influencing Geography Teacher Education students (Rebuilt from the concept map of Fran Martin, 2008)

Geography student teachers still tend to appreciate knowledge over experience. There are 50% of respondents said that using knowledge in the textbooks would correctly solve a problem in geography learning compared with 29,2% who chose to use experience and knowledge in the question: "What is a priority to make sure that knowledge is accurate when solving a problem in learning geography?" School culture is one of the factors influencing this trend. From high school to university, students' learning styles are "obedience" and "reappearance", which has gradually shaped a "learning culture". This makes students feel "safe" with the knowledge provided by the curriculum and faculty during study and exams. As a result, experience has no place in the learning process. The deep root is related to the educational goals and the way to evaluate learning outcomes. Evaluation stops at Knowing and Understanding and does not emphasize practicality because both teachers and students do not dare to step out of the testing safety zone.

Notes from experience: when teaching the "Project Teaching" module, we asked students to do projects on Vietnam's regional geography. Students were divided into groups with the following criteria: either coming from the same locality (province/ city) or the same region (seven economic regions). Each team took a project related to locality/ region. In another course, we did a project on tourism geography, this time the students were divided into groups of different ethnic groups and regions to do a project on the impacts of the local culture on travel. The products of the above-mentioned projects show that student groups show a good understanding of culture, characteristics of the locality or ethnic group. However, they have a little difficulty in connecting external manifestations to explain nature by geographical knowledge. An additional student survey was conducted to support the above results. The results indicated that nearly 80% (79.2%) of students said that they fully understood and understood their local culture and ethnology. By contrast, there are more than 50% (58.3%) of opinions about applying local culture and ethnic culture knowledge to understand geographic knowledge in university at a "normal" level compared to that with 33,3% rated "proficient". At this point, the learning project needs to be moved to the next

stage, which is the guidance of the lecturers so that learners know how to connect the experience of their life and their community with geographic concepts.

It is the responsibility of lecturers to help students see the role of experiential knowledge and to show them how to enrich and connect experience with theoretical knowledge to serve to teach. Teaching based on constructivist theory, experiential learning will be an appropriate approach to implement this orientation. Field trips (Geology - Maps; General natural geography, socio-economic geography) are very valuable to the training process and training quality. The nature and society in the field, the key site is reality a lifelike laboratory (Nguyen., Do, 2016)

3.3. Knowledge from Geography Teacher Education students training program

The curriculum for Geography student teachers in universities systematically provides geographic knowledge and pedagogical knowledge for students. An analysis of the curriculums for Geography student teachers of five universities in the Southeast and the Mekong River Delta is presented below.

The curriculum frameworks are presented in different structures. However, the common characteristics between these programs are: The course can be divided into four groups: general knowledge, general foundation knowledge, content knowledge, internship knowledge, and graduation thesis./alternative courses.

- *General knowledge*: Includes subjects on political education, law, foreign languages, computing, physical education, security – defense, accounting for more than 18% of the total number of credits and is relatively consistent across universities.

- *General foundation knowledge*: Includes course related to educational science and pedagogy such as Introduction to the teaching career, general education, general education, psychology, scientific research methods. This type of knowledge accounts for the lowest proportion in the entire curriculum (9%).

- *Content knowledge*: The course can be divided into two groups

+ *Knowledge about geoscience*: This type of knowledge ensures that students have complete and systematic knowledge and skills of Geography. The subjects include Maps, GIS, Geology, General natural geography, general socio-economic geography, world geography, Vietnam geography, local geography, geoscience research methodology... With a nearly 50% of the total course, geographic content knowledge has the largest proportion.

+ *Specialized professional knowledge*: Includes subjects related to specialized teaching methods such as Geography theory and teaching methods, Development of geography curriculum, Assessment in teaching Geography, Regularly trained Geography pedagogical profession, The application of IT to teaching Geography, geography teaching method in high school. This type of knowledge accounts for an inconsiderable proportion of about 12% of the curriculum total courses/credits.

- *Internship knowledge, graduation thesis, alternative courses:* Pedagogical internship, graduation thesis, graduation essay, alternative courses make up 11%.

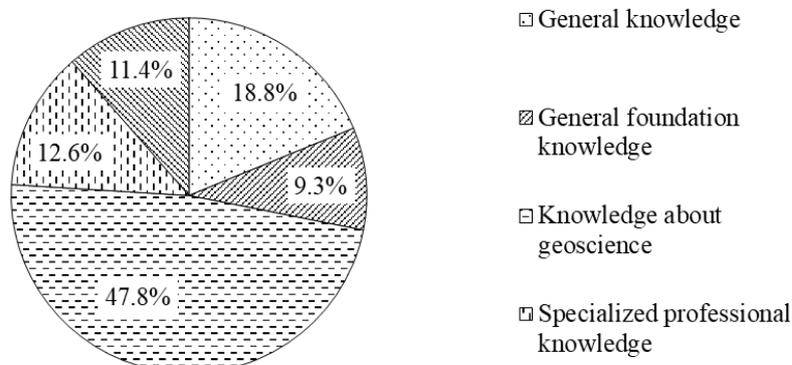


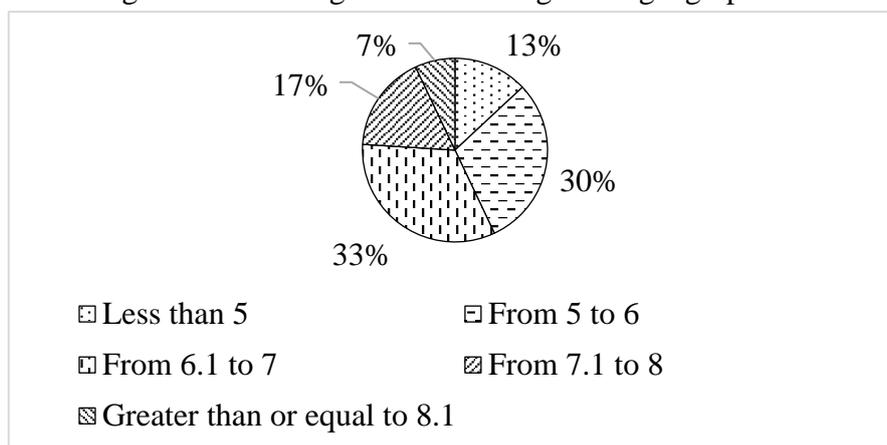
Figure 5. The average ratio of knowledge blocks in the Geography Teacher Education Curricula of five universities in the Southeast and the Mekong River Delta (Source: Training programs for Geography student teachers at the university level at five schools in the Southeast and the Mekong River Delta)

Thus, except for general knowledge, geographic content knowledge accounts for an average of 50%, pedagogical knowledge and geographic pedagogical knowledge account for more than 30% of the training program volume. Theoretically, this ratio is reasonable in training Geography student teachers with "strong expertise, professional proficiency". However, in practice, many problems arise:

Firstly, the connection between geographic knowledge trained at the undergraduate level and geographic knowledge in high school. Geographic knowledge taught in the majors at the university level and Geography in high schools have a relative homogeneity of content and structure because the goal of pedagogy universities' training is to provide high schools with Geography teachers. This amount of knowledge must be much larger than the general geographic knowledge with the motto "learn ten to teach one". In theory, once student teachers have specialized geography knowledge, learners will understand more deeply and easily than general geographic knowledge. After finishing content knowledge course (content knowledge), students have enough knowledge to learn specialized courses (PCK). However, in practice, ideal results are often not achieved. The following evidence from a multiple-choice test and micro-video analysis may support and explain part of the findings.

Seniors in Geography Teacher Education were given a geography knowledge quiz. The test consists of 50 questions about general geographic knowledge and skills: General natural geography and socio-economic development, Vietnam's geography, understanding of topical and practical geographic issues, skills in maps, charts, data tables. The questionnaire system is divided into four levels: know, understand, low application, and high application. The average score is shown in the chart (Figure 6). The average score is 6.2. The majority of students have scores ranging from 5 to 7 points, accounting for 63%. The

proportion of scores above 8 points is very low (7%). This result partly reflects the level of knowledge that students have until the end of junior year. Subjective reasons are on the part of learners, whose knowledge is not sustainable, and their applicability is still limited, also their limited understanding. For the objective reason, it is possible that lecturers of the subject have not taught the knowledge content with general geographic knowledge.



Average score: 6.2; Median score of 6.2; Threshold: 4.4 - 8.6

Figure 6. Results of juniors' scores on high school geographic knowledge and skills test

The analysis of the micro-video system of juniors and seniors who practice teaching, including phenomenon explanation skills, geographic process skills, question use skills, skills in using geography means shows that the background of general geography knowledge of students is still limited in geographic symbols and concepts, especially natural geography: wind blows or Coriolis force.

Second, there is a relative separation between geographic knowledge and geographic pedagogical knowledge in the student learning process. In a study of micro-methods, we conducted video analysis in terms of the skills of explaining geographic concepts, phenomena, and processes (seasonal long and short days and nights, according to latitude, cyclones, land-sea breeze, Coriolis force). Most of the students face some of the following difficulties and limitations:

+ Students have not determined the sequence of factors/components when explaining a concept. That is, in their explanation, they have not “explained” the concept, have not determined which elements must be presented first or later so that learners can properly understand that concept. For example, to thoroughly explain the formation and action mechanism of the land-sea breeze, learners must understand the difference in day and night and barometric pressure of land and sea. However, before coming to the explanation related to the barometric pressure, the heat capacity or the laws of heat absorption and radiation of soil and water must be mentioned. Therefore, the logic of the problem decreases and the explanation becomes confusing.

+ *Students sometimes have not fully explained the nature of some concepts.* They can present clearly and completely the content of a geographic concept, thing, or phenomenon, but when asking some more questions to check the understanding of the concept, students have difficulty in answering or answer incorrectly. The Coriolis force phenomenon is an example. Most students could not clearly explain why in the Northern hemisphere, when geographic objects are in motions, they are lopsided to the right of their original motion direction, and in the Southern hemisphere, it is the opposite. Although many students can give reasons such as The Earth rotates from the West to the East, the linear velocities at different latitudes are different, the object must maintain its linearity when moving, they still do not understand the true nature of the concept. This statement is demonstrated with only 25% of students can clearly explain this problem before they are re-guided in the Geography teaching methodology course.

+ *Students often cannot apply the law of forming geographic concepts when explanation.* They often do not pay much attention to the formation or use of symbols before explaining concepts. Specifically, they often do not point out the manifestation of the phenomenon before explaining the nature of the phenomenon. Many students do not use or know how to choose a visual medium when they explain concepts that can only be indirectly perceived. Using practical examples to clarify the conceptual nature of learners can be understood that most students are not flexible.

The aforementioned limitations can be explained by some reasons:

+ *For many students, geographic knowledge and geography teaching method knowledge exist separately while they study specialized subjects.* From Martin's research and teaching experience, it can be seen that pedagogical students tend to separate acquiring content knowledge and pedagogical methods (Martin, 2008). They often pay attention solely to the learning content but less attention to the method their teachers use to teach it. Consequently, when they practice teaching similar content in their junior and senior years, they encounter difficulty.

+ *Specialized instructors may have placed more emphasis on content knowledge than PCK.* Therefore, learners will not have access to specific methods of teaching knowledge units. The instructor does not provide orientation for the methodology of content teaching. Geography teaching methodology is considered as the task of teachers of the Teaching Pedagogy department. On the lecturers' part, they do not have enough time to guide students thoroughly about the methods and how to teach individual concepts.

Geography teachers need to enhance their pedagogical competencies regularly. The solutions should focus on improving research methodology in applied pedagogical science and ICT application in geography education. Develop pedagogical competence for geographic students by micro-teaching method; Train pedagogical skills for freshmen to seniors; Promote the role of the pedagogical practice school in experimenting with the

scientific research results of teachers and their participation in instructing students to practice are among suggestions mentioned by Dang Van Duc and Pham Thi Thanh (Dang, & Pham, 2015)

4. Conclusions

This research has established and analyzed the factors affecting the formation of PCK of Geography student teachers in the practical context. This result provides suggestions for improving the curriculum and innovating training methods for Geography student teachers. Student's school experience and life experience should be considered as an important element when designing a curriculum and using a teaching method. However, this research is limited to examining previously proven theoretical models based on reality without sufficient reasons for each factor affecting the student's PCK-G. Therefore, further studies can be conducted based on the results in this study: convincing evidence is needed for each factor affecting PCK- G integrating with research on measures to develop geography pedagogical knowledge.

❖ **Conflict of Interest:** Author have no conflict of interest to declare.

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CÁC YẾU TỐ TÁC ĐỘNG ĐẾN VIỆC HÌNH THÀNH KIẾN THỨC NỘI DUNG SƯ PHẠM CỦA SINH VIÊN NGÀNH SƯ PHẠM ĐỊA LÍ

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TÓM TẮT

Bài báo này phân tích các yếu tố ảnh hưởng đến quá trình hình thành và phát triển kiến thức sư phạm chuyên ngành của sinh viên sư phạm Địa lí. Trên cơ sở vận dụng mô hình PCK (Pedagogical Content Knowledge – kiến thức nội dung sư phạm) và mô hình PCK của giáo viên Địa lí, chúng tôi xây dựng mô hình lí thuyết và lí giải các nhân tố hình thành nên kiến thức sư phạm địa lí của sinh viên. Nghiên cứu định tính là nhóm phương pháp chủ yếu được sử dụng; trong đó, nghiên cứu lí thuyết, phương pháp chuyên gia, giảng dạy vi mô, phương pháp thống kê và tổng kết kinh nghiệm giảng dạy là các phương pháp được sử dụng để phục vụ nghiên cứu. Kết quả nghiên cứu cho thấy các nhân tố chính tác động đến việc hình thành PCK của sinh viên ngành Sư phạm Địa lí bao gồm: Sự hiểu biết của sinh viên về địa lí, kiến thức địa lí sinh viên tích lũy được khi còn là học sinh và kiến thức từ chương trình đào tạo giáo viên Địa lí.

Từ khóa: kiến thức sư phạm Địa lí; sinh viên sư phạm Địa lí; kiến thức sư phạm chuyên môn