Summary

Context of this research

The question that is central to this thesis is how we can prepare future primary school teachers to give good, inspiring geography lessons. The assumption is that we can improve the current situation. Whether this assumption is correct and how that improvement can occur is the question of this research. This issue has a number of complicating factors.

In primary teacher education, geography is just one of many subjects. It is also a relatively small subject for which relatively few teaching hours are available.

Another important factor is that in the Netherlands, student teachers can enter primary teacher education after completing their secondary education (five or six years) with or without a final exam in geography or after their training as a teaching assistant. This second group of student teachers would have had their last geography lesson at least four years ago.

Finally, no national curriculum exists for primary teacher education. This is also true for the subject of geography. Institutes develop their own curriculum and teacher educators develop their own courses.

This combination of a limited number of teaching hours, little subject knowledge, a diverse group of students and few guidelines for educational content creates a challenging situation for teacher education in the Netherlands to prepare future primary school teachers in such a way that they are able to teach the subject of geography properly and in an inspiring way. This is a difficult task that requires informed educational choices and tools for geography educators.

In this thesis, against this background, four studies examine what is needed and possible to develop the Pedagogical Content Knowledge for the subject of Geography (PCK-G) for first-year primary student teachers. The central concept of PCK-G in this study is defined as the combination of content knowledge (*what*), pedagogical knowledge (*how*) and the consciousness of what one does, why, and how (*why*). The underlying, ultimate goal is to contribute to the improvement of geography education in primary teacher education with this research and thus, indirectly, improve the quality of geography teaching at primary schools

Within this central concept PCK-G, geography can be described as the study of the Earth and the relations and interactions between people and the environment at different levels of scale (International Geographical Union, 2016). To be able to understand and explain these relations and interactions and to ask geographical questions, key concepts are used (Haubrich, 1992; Taylor, 2008). In this thesis five geographical key concepts are presented: where, why there, scale, change and effects or pros and cons . These concepts are derived from classifications made by different authors and discussed with colleagues from the field of geography education.

Main findings

To identify the problems from the perspective of geography teacher educators, a first study is conducted. This sub-study illustrates what level of PCK-G student teachers should achieve according to their teacher educators and what level they should have reached by the end of their training. It concerns a descriptive study based on a national survey among all geography teacher educators at teacher education institutes in the Netherlands.

According to the 39 teacher educators who completed the survey, the majority of the student teachers only partially achieve the desired level of PCK-G at the end of training. The teacher educators think, for example, that many student teachers at the end of their training are not able to explain an issue such as climate change or to incorporate map skills into their lessons in primary school. The gap experienced by the teacher educators between the desired and the achieved level of the PCK-G is, according to them, mainly due to the limited number of teaching hours for the subject and a lack of emphasis on content knowledge within the programme. The teacher educators also identified the varying knowledgebase of the student teachers at the start of the programme as an important limiting factor in properly developing their PCK-G. According to

teacher educators, the differences in starting level combined with the limited number of teaching hours makes it difficult to develop suitable educational opportunities for everyone.

Sub-study two reports on the development of Consciously Teaching Geography (CTG), a course developed through educational design research for first year student teachers that is intended to address this problem. The design process started with three successive discussion meetings with geography-teacher educators and experts from the field of geography and geography teaching. In these meetings, an initial geography-lesson framework was discussed and adjusted based on state-of-the-art scientific knowledge.
The discussion meetings resulted in four basic principles for the design to meet. The course should include the following:

a) be constructed from a framework of key geographic concepts,
b) use student-teachers' preconceptions and everyday geographic examples as a starting point for the lessons,
c) use proven effective teaching strategies, such as explicit modelling, by the teacher educators and various forms of active learning, and
d) stimulate reflection to accomplish *conscious* learning by the student teachers.

The discussion meetings resulted in the first version of the CTG course. Subsequently, the practicality of the course was tested in two trial rounds. In each round, two geography-teacher educators with their groups of first-year student teachers used the course in their programmes. Their experiences and results were recorded. Thus, the CTG course assumed its final form. During the trial rounds, measurement instruments were developed and tested.

The results reveal that to make the design consistent, additional design principles were necessary. Flexible use of the framework was required to accommodate the teaching styles of the teacher educators and the couleur locale of their institutes.

Moreover, it proved necessary to guide student teachers stepwise in working with the framework. That led to the addition of scaffolding by the teacher educator and a stronger use of activating teaching methods. Finally, it became clear that the teacher educators needed more comprehensive training and a more detailed manual with emphasis on the underlying principles to attain a good performance.

The CTG course is a framework that defines seven characteristics of a good geography lesson. Five of these characteristics are based on core geography concepts. Each characteristic is formulated as a question that student teachers can use when preparing a lesson. The following five geographic questions resulted from the study: *Where is it? Why is it there? What do I see if I zoom in or out? How does it change over time?* and *What are the consequences, advantages and disadvantages?* In addition to those questions, two more general pedagogical questions were formulated: *How can I start the lesson in a motivating way?* and *How can I end the lesson in a way that promotes transfer?*

The complete CTG course consists of five 90-minute meetings during which the characteristics were applied in different contexts, the teacher educators use explicit modelling, and there was room for reflection.

Through improvements in the flexibility of the course and the preparation of the teacher educators, the practicality of the course was secured to a sustainable design that could be executed within different educational contexts. This is important given the lack of a national curriculum for teacher education in the Netherlands.

The next logical question was whether this sustainable design would actually be effective in stimulating the PCK-G of the intended users: first year primary student teachers. To this end, a quasi-experimental research design with a control group and pre-post testing is used. The nearly 450 student teachers that participated in the study were taught in twelve classes. Six classes were assigned to the experimental condition and six classes to the control condition. The experimental classes followed the CTG course, and the control classes used regular geography lessons. In both types of class (i.e. experimental and regular), the same topics were taught.

To be able to measure the effect of the course on the development of the PCK-G of the student teachers, different measurement instruments were used. Substantial knowledge (*what*) and syntactic knowledge (*how*) were measured using the Test Review Lesson Plans (pre- and post-test) and the Test Own Lesson Design (post-test only). Beliefs regarding the subject (*why*) were also measured by the latter test. To collect background information, all students were required to complete a short biographical questionnaire.

Our results reveal that the CTG course had a significant positive effect on the substantial (*what*) and syntactic (*how*) knowledge of first-year student teachers immediately after the course, that is, on the use of the characteristics of a good geography lesson, in the short term. Long-term effects (i.e., two months after completion of the course) were not found. In addition, no effect was found on the conscious use of the characteristics of a good geography lesson, that is, the beliefs regarding the subject (*why*). This outcome was valid immediately after completion of the course and two months after the end of the course.

Finally, sub-study four examined the returns of the CTG course from the perspective of the student teachers. Based on the idea that learner perspectives can inform our understanding of effective educational practice, a 'learner report' was used in which the student teachers reported what they learned from the course.

After each course meeting, the student teachers reported their learning experiences. From the total of 1179 filled-in learner reports completed by the first-year student teachers, they mainly reported elements concerning the learning process (i.e. syntactic knowledge/*how*). They primarily viewed the seven characteristics of a good geography lesson as a pedagogical instrument, although substantive knowledge (*what*) and syntactic knowledge (*how*) were taught in an integrated manner.

However, there are differences between students who were taught by different teacher educators. In settings in which there was a stronger emphasis on content knowledge and in which this knowledge was assessed, student teachers reported more substantive knowledge. The large majority of the statements that student teachers provided were not domain specific.

Implications

This research shows that it is possible to develop Pedagogical Content Knowledge for the subject of geography for first-year primary student teachers and that the course Consciously Teaching Geography (CTG) proved to be an effective instrument. It appeared important for the course to be flexible enough to apply in different educational contexts and to the various teaching styles of teacher educators. It has also become clear that the teacher educators need adequate instruction and practical tools for the use of the course and that student teachers should be allowed ample opportunity to actively practice with the presented approach in different contexts.

That the CTG course proves effective is even more interesting because it only involves a short course of five lessons. In the future, it is important to investigate whether student teachers, when integrating geographical core concepts and the seven characteristics of a good geography lesson in other geography courses, eventually come to conscious knowledge and transfer, which were results the short CTG course could not achieve. In this way they - as future teachers - really know 'why they do what they do' in the subject of geography.

The results of this study can be used to further develop better geography education in primary teacher education and primary education. Within the community of geography-teacher educators, the approach followed in this research may be further developed to stimulate the role of teacher educators as curriculum makers. Additionally, we may try to construct a bridge between a geographically relevant and robust curriculum and the preconditions imposed by the various institutes.

Furthermore, it would be interesting to research how - e.g. in a learner community of student teachers, teacher educators and primary-school teachers - the approach of the CTG course would promote the PCK-G development of the (student) teachers.

Finally, a similar study in a more international context and on a larger scale can provide a broader view of the effect of the approach in different educational settings.

The approach can also serve as a model for training programmes for other subjects (e.g., history or science). Further research could focus on the usefulness of this method in other school subjects.