Inter TeTra – A specialized partnership between the University of Siegen and the National University of Education in Hanoi

- Description of the project idea –

The primary goal of the OECD and the educational authority in Vietnam is to reform their educational policy by developing a more competency-related curriculum (Communist party of Vietnam 2013). Germany has two decades of experience with these types of reforms. TIMSS and PISA studies show the opportunities and challenges such reforms can present (KMK, 2004). These experiences show how teacher training is critical to the success of school reform (Hattie & Beywl 2013).

The cooperation between German and Vietnamese educators offers the opportunity to avoid well-known problems in implementing such reforms. In addition, it can generate new knowledge out of the cultural and structural differences between the two societies, allowing for the further development and implementation of novel and distinctive curricula. Consequently, the DAAD endorses the Inter-Tetra project (the name of the project is a short form for Interdisciplinary Teacher Training), a subject-related partnership established between the University of Siegen and the Hanoi National University of Education (HNUE). The primary goal of this project is to design a permanent module for the subjects of mathematics and physics at the HNUE and perform interdisciplinary on the job teacher training. One of the distinguishing features of this course is that the exchange should begin with a view beyond subject boundaries. Since 2000, the advantages of interdisciplinary work in teaching and learning in schools has been emphasized, mostly in the form of problem-oriented and cross-disciplinary teaching, that is organized in projects (Labudde, 2014 or Moegling 2010). In order to achieve the greatest educational benefits, numerous variants of these demanding and complex learning concepts have been developed (Caviola, 2012 or also Labudde 2008). The ability to systematically combine, apply and reflect knowledge from different disciplines is the goal of this project. However, in spite of all of the educational advantages, interdisciplinary work also reveals many challenges. The combination of different methods of the participating subjects, overcoming communication difficulties, the identification of common research subjects, the handling of prejudices as well as the handling of group dynamic processes, are only some of the problems of interdisciplinary cooperation (Defila, R., & Di Giulio, A. 2002, p. 24). Despite the many benefits of interdisciplinary teaching and learning at school, University teacher training is still largely organized in a discipline-oriented manner. The first phase of the teacher training should already clarify the advantages and tackle the challenges of an interdisciplinary education. If interdisciplinary teaching and learning in schools should be more than the additive juxtaposition of knowledge elements from different disciplines (Wellensiek, 2002, p. 80), the universities should implement holistic concepts for integrative teacher education. The inadequate fit of non-integrated teacher education with the requirements of interdisciplinary teaching (Bröll & Friedrich, 2012) is repeatedly cited by teachers in schools as an objection to integrated instruction (Jürgensen 2012, Rehm 2008). The frequently discussed difficulties in connection with non-specialist teaching should also be considered against this background (Porsch 2016).

Appropriate didactic concepts have already been developed at some universities (Witzke, 2015 or Krause & Witzke, 2017). The University of Siegen works currently on interdisciplinary education projects such as

MINTUS, FäMaPdi and InForM PLUS (Krause, 2017 or Holten & Witzke 2017). For this purpose, the subjects of mathematics and physics seem to be the most appropriate, since these subjects have numerous epistemological parallels (Krause, 2016).

Vietnam already has its first approaches to establishing subject-linking lessons (Nguyen and Than, 2014 or even Nguyen 2015). In contrast to this, the present project does not initially focus on interdisciplinary teaching in Vietnamese schools, but starts earlier by adding an interdisciplinary module to teacher education. In this way, the connecting element in the subject-linking lessons of the future is not only the common subject of instruction (which is viewed from the perspective of different subjects) but rather the lessons are embedded in the comparative discussion of didactic theories in the participating subjects from the very beginning, with the goal of concretization and implementation in the curricula in Vietnam. This approach is an innovation especially for Vietnam, where teacher training is currently very isolated and compartmentalized. While the modern application-oriented teaching of mathematics looks to physics didactic concepts for experimentation, modern physics teaching also requires mathematical didactic knowledge to deal with mathematization (Schwarz, 2016). Consequently, the repertoire of future teachers will become richer by incorporating the didactics of neighboring subjects.

The previously mentioned projects at the University of Siegen have demonstrated that interdisciplinary teaching in teacher education provides a deeper insight into the didactics of the primary subject (Witzke 2015). The combination of didactic theory and teaching practice is particularly important to our approach. In addition to the theoretical sections, the courses mentioned and planned in this project will also include lessons at schools. These lessons will be videotaped and incorporated into the previously discussed theory. This combination of theoretical lessons and review is established in North Rhine-Westphalia during the practical semester in teacher training (Hoffart and Helmerich, 2016). Such a theory-based classroom reflection research is not yet part of teacher education in Vietnam.

For the previously mentioned reasons, the mathematics and physics educators at the University of Siegen are planning to cooperate with the relevant institutes of the Hanoi National University of Education (HNUE). They aim to make a meaningful and lasting impact through teacher training, combining classroom teaching with practical instruction. The goal is to develop a competence-oriented curriculum for teacher training in Hanoi. The Vietnamese partner university is the authoritative body of educational policy reforms within the country, ensuring later dissemination of the developed module. This project's research goals are to clarify relevant topics for an interdisciplinary exchange between mathematics and physics didactics, develop this content for use in a textbook for student teachers and to design and implement a corresponding module in teacher training at HNUE. The performance of the courses will be evaluated in order to assess the effectiveness of interdisciplinary teaching in the subjects of mathematics and physics during the training of prospective teachers.

In this project, there is an intellectual exchange between four institutes. Each institute will be focusing primarily on the mathematics and physics disciplines in Hanoi and Siegen as well as four components of teacher training and further education, hence the derivation of the name Inter-Tetra from the Latin "Inter" (between) and Greek "Tetra" (four) and its dual connotation for Interdisciplinary Teacher Training.

Literature

Bröll, L., & Friedrich, J. (2012). Zur Qualifikation der Lehrkräfte für den NWA-Unterricht – eine Bestandsaufnahme in Baden-Württemberg. Der mathematische und naturwissenschaftliche Unterricht, 65(3), S. 180–186.

Caviola, H. (2012). Wie Fächer miteinander ins Gespräch kommen: Modelle der Fächervernetzung
und ihre Lernziele. In H. Caviola, I. Widmer Märki, P. Labudde, M. Müller, G. Feurle, H. v. Fabeck,. . . R. Güdel (Eds.), TriOS: Nr. 2/2012. Interdisziplinarität (pp. 5–36). Münster: LIT-Verlag.

Communist party of Vietnam (2013): Resolution on "Fundamental and comprehensive innovation in education, serving industrialization and modernization in a socialist-oriented market economy during international integration" ratified in the 8th session.

Defila, R., & Di Giulio, A. (2002). "Interdisziplinarität" in der wissenschaftlichen Diskussion und Konsequenzen für die Lehrerbildung. In A. Wellensiek (Ed.), Beltz Wissenschaft: Bd. 38. Interdisziplinäres Lehren und Lernen in der Lehrerbildung. Perspektiven für innovative Ausbildungskonzepte. Weinheim, Basel: Beltz. p. 17–29

Hattie, J., & Beywl, W. (2013). Lernen sichtbar machen (Überarb. dt.-sprachige Ausg). Baltmannsweiler: Schneider-Verl. Hohengehren.

Hoffart, E. & Helmerich, M. (2016):„In der Situation ist mir das gar nicht aufgefallen!" Reflexionsanlässe in der Lehrerbildung als Bindeglied zwischen Theorie und Praxis. In: U. Kortenkamp & A. Kuzle (Hrsg.): Beiträge zum Mathematikunterricht 2016. Münster: WTM-Verlag, 433-436.

Holten, K. & Witzke, I. (2017): Chancen und Herausforderungen von fachdidaktischverbindenden Elementen in der Lehramtsausbildung. In: Beiträge zum Mathematikunterricht, 50.

Jürgensen, F. (2012). Das integrierte Fach Naturwissenschaften und seine Beliebtheit bei Lehrern und Schülern. In E. Rossa (Ed.), Chemie-Didaktik. Praxishandbuch für die Sekundarstufe I und II, 2nd ed., Berlin: Cornelsen Scriptor. p. 197–230.

KMK (2004). Standards für die Lehrerbildung: Bildungswissenschaften. Beschluss vom 16.12.2003 i.d.F. vom 12.06.2014. Kultusministerkonferenz 16.12.2004.

Krause, E. (2016): Erkenntnistheoretische Parallelen zwischen Mathematik und Physik. In: PhyDidB – Didaktik der Physik, Beitrag DD 8.4.

Krause, E., & Witzke, I. (Eds.). (2017). Mathematikunterricht im Kontext physikalischer Anwendungen – Grundlegungen und Konzepte zu fächerverbindendem Unterricht. Im Erscheinen.

Krause, E.; Witzke, I. (2015): Fächerverbindung von Mathematik und Physik im Unterricht und in der didaktischen Forschung. In: PhyDidB – Didaktik der Physik, Beitrag DD 8.3.

Labudde, P. (Ed.). (2008). Naturwissenschaften vernetzen - Horizonte erweitern:Fächerübergreifender Unterricht konkret (1. Auflage). Seelze-Velber: Klett/Kallmeyer.

Labudde, P. (2014). Fächerübergreifender naturwissenschaftlicher Unterricht – Mythen, Definitionen, Fakten. Zeitschrift für Didaktik der Naturwissenschaften, 20(1), 11–19.

Merzyn, G. (2013). Fachsystematischer Unterricht: Eine umstrittene Konzeption. Der mathematische und naturwissenschaftliche Unterricht, 66(5), S. 265–269.

Moegling, K. (2010). Kompetenzaufbau im fächerübergreifenden Unterricht: Förderung vernetzten Denkens und komplexen Handelns ; didaktische Grundlagen, Modelle und Unterrichtsbeispiele für die Sekundarstufen I und II. Reihe: Vol. 2. Immenhausen bei Kassel: Prolog-Verl.

Nguyen V. B., Thanh H. N. (2014): Integrierter Naturwissenschaftenunterricht. In: Educational Equipment Magazine, Nr. 110.

Nguyen V. B. (2015): Entwicklung interdisziplinärer Themen im Naturwissenschaftsunterricht. In: JOURNAL OF SCIENCE OF HNUE, Vol. 60, Nr. 2, S. 61-66.

Porsch, R. (2016). Fachfremd unterrichten in Deutschland. Definition - Verbreitung - Auswirkungen. Die Deutsche Schule, 108(1), S. 9–32.

Rehm, M., Bünder, W., Haas, T., Buck, P., Labudde, P., Brovelli, D.,. . . Svoboda, G. (2008). Legitimationen und Fundamente eines integrierten Unterrichtsfachs Science. Zeitschrift für Didaktik der Naturwissenschaften, 14, S. 99–123.

Schwarz, O. (2016): Vorwort zur zweiten Auflage. In: Kuhn, W. (2016): Ideengeschichte der Physik. Berlin: Springer-Verlag.

Wellensiek, A. (Ed.). (2002). Beltz Wissenschaft: Bd. 38. Interdisziplinäres Lehren und Lernen in der Lehrerbildung: Perspektiven für innovative Ausbildungskonzepte. Weinheim, Basel: Beltz.

Witzke, I. (2015).Fachdidaktischverbindendes Lernen und Lehren im MINT- Bereich. In: Beiträge zum Mathematikunterricht, 48.