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Research Article

HOW DO PUPILS PERCEIVE MATERIAL PHENOMENA AND INTERPRET OBSERVATIONS?: A STUDENT RESEARCH REPORT ON AN EFFERVESCENT POWDER EXPERIMENT IN CHEMISTRY TEACHER EDUCATION

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ABSTRACT

The research-oriented approach to teacher education, known as "research in teaching," contributes to the development of student teachers' competencies, including independent thinking, reflective teaching, and the ability to analyze and interpret phenomena arising in chemistry teaching and education. In particular, teaching practicums provide student teachers with their first opportunities to apply foundational theoretical knowledge to planning and designing chemistry lessons. During these practicums, students identify, investigate, and analyze specific situations, often involving discrepancies or contradictions between lesson plans and actual classroom practices, based on their professional learning needs. Through this process, they gradually develop or reconstruct their understanding of chemistry didactics. They also become increasingly capable of examining and evaluating teaching practices in light of the theoretical knowledge they have acquired, an important condition for developing professional teaching competence. Based on practical experience and feedback from student teachers, chemistry didactics and methodology courses can become more meaningful and effective when greater emphasis is placed on actual classroom practices through the analysis, reporting, and discussion of chemistry lessons conducted in real teaching settings.[1]

Keywords: teacher behavior; pupil behavior; guidance in scientific methods; higher education didactics; theory–practice relationship; teacher competencies; student teachers' perceptions

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[1] This article focuses on chemistry didactics and illustrates an approach to higher education teaching. I have advocated this approach for decades: preservice chemistry teachers should develop the ability to theorize about lesson design during teaching and to reflect afterward, following the ideas of the German didactics theorist Heimann (1962). Schön (1983) proposed a related approach to educating architecture students, emphasizing reflection during design. I expanded Heimann's approach. Students must also reflect on the wider practice of chemistry education. Through inquiry- and action-based learning, students develop their own research projects. The underlying idea has a long history in philosophical thought. It also appears in Soviet and Russian educational thought (e.g., Vygotsky and Galperin). In Aristotelian terms, it relates to *techne* ("making"); in Marxian terms, it concerns the transformation of existing conditions ("changing").

1. Preliminary Remarks—"Research in Teaching" as an Approach to Higher Education Didactics (Hans-Juergen Becker)

This article illustrates my "Research in Teaching" approach to higher education didactics, developed between 1978 and 2021 (Becker, 1978, 1989, 1993, 1995, 1997, 2005, 2010, 2018, 2020). In particular, the teaching practicum, which preservice teachers complete under guidance and supervision, provides valuable opportunities to investigate questions arising in chemistry classrooms, as my experience over many years suggests.

The approach encourages preservice teachers to investigate questions in subject-specific didactics that arise from their coursework or their own interests. Students document their findings and interpretations in research reports. Here, research is understood as a systematic effort to seek, extend, verify, and document knowledge. "Research in teaching" also involves reflection and self-reflection, the application of theory in classroom situations, repeated practice, the development of classroom routines, and growing confidence in professional action. It encourages students to examine the relationship between theory and practice as it unfolds in particular teaching situations. Such situations are diverse and cannot be fully captured by existing knowledge of chemistry didactics. General principles and recommendations are therefore necessarily limited in their applicability. Teaching methods, including those commonly used in Vietnam, are shaped by numerous known and potentially unknown variables and their interactions, unlike the more readily identifiable variables in many chemical processes.

From the many student assignments I have supervised, including seminar papers, presentations, and bachelor's and master's theses, I selected a report written by Jens Muenzel in the summer semester of 2003. The didactic question addressed in his report remains important for chemistry education worldwide. Muenzel examines whether and how pupils perceive and remember material changes and how they interpret their observations. Observation is fundamental to chemistry, but what pupils notice does not necessarily correspond to a scientifically informed interpretation. The report also highlights pupils' behavior as an important focus of teacher education. Research in learning psychology, social and emotional development, pedagogy, and communication has long underscored the need for chemistry teachers to attend to pupils' responses during lessons. In my view, this concern remains relevant across educational contexts.

Effervescent powder may also be a familiar and engaging material across cultures[2]. It has long been popular among children. As a familiar everyday mixture, effervescent powder is used in chemistry lessons in both Germany and Vietnam. Any tasting or sampling was carried out with appropriate precautions (using a straw to take a drop of the aqueous solution). Such sensory activities provided pupils with direct experience of the materials. Today, its sugar content may make it a less suitable ingredient for a simple lemonade.

[2]Effervescent powder also appears in German literature (Guenter Grass, The Tin Drum (Die Blechtrommel), 1959)

The student report's structure and numerical tables have been retained, with language edits for clarity. The student report focuses solely on the research question, without presenting details of teacher training in Germany (see Becker & Nguyen, 2013a, 2013b, 2014a, 2014b) or providing the complete lesson plan. I have added dates and locations.

2. The student report (Jens Muenzel)

2.1. The research question and research conditions

In the seminar "School-Oriented Experimentation – Fundamentals" (Winter Semester 2002/2003) at the University of Paderborn[3], we discussed pupils' perception of experimental phenomena as a prerequisite for effective learning. The discussion addressed technical and material aspects of the experimental apparatus, visibility in the classroom, and the importance of clearly arranged apparatus for chemistry demonstrations, drawing on Wertheimer's and Koehler's Gestalt principles. A clear arrangement helps pupils perceive the apparatus as a whole rather than as unrelated parts. Furthermore, studies in perceptual psychology suggest that pupils may overlook phenomena, observe them indistinctly, or recall them inaccurately, particularly when apparatus is unfamiliar (note: e.g., Klaetsch, 2002; Schmidkunz & Klaetsch, 1996). Other relevant factors include the classroom environment, pupils' concentration, teacher–pupil relationships, and the personal significance of experimental effects.

These ideas prompted me to test what I had learned at university during my teaching practicum. With 15-year-old pupils in a Grade 9 class at the Friedrich-Spee-Gymnasium in Rüthen, a small town in North Rhine-Westphalia, Germany, I conducted the following experiment as part of a lesson on "The Composition of Effervescent Powder."

2.2. The Experiment: "Mixing Effervescent Powder"

- I introduced the three everyday substances—glucose (grape sugar), citric acid, and sodium bicarbonate (baking soda)—and named each one. Not all pupils were familiar with baking soda.
- The substances were tested for smell, taste, and appearance.
- The solubility of the three substances in water was tested.
- The addition of bromothymol blue to all solutions produced color changes in the aqueous solutions.
- The three substances were mixed together.
- The mixture was again tested for appearance, smell, and, with appropriate precautions, taste.
- When dissolved in water, the characteristic effervescence was observed (fizzing and gas bubbles, indicating the release of carbon dioxide).

All pupils were asked to write down their observations. I wanted to find out not only what the pupils perceived but also whether and how they interpreted the phenomena (see Table 1). I therefore focus on pupils' reported observations and interpretations rather than on the sequence of the lesson itself.

[3]Paderborn is a medium-sized city in North Rhine-Westphalia, Germany.

2.3. Results: Recalled Observations

The pupils recalled five aspects of the experiment:

1. Three different substances (appearance, taste, and name)
2. Dissolving the three substances in water
3. Gas formation of the mixture when dissolved in water
4. Addition of an indicator (color changes)
5. Product formed (effervescent powder or effervescent product)

I had emphasized these phenomena during the lesson. Table 1 presents the percentages of the 40 pupils who recalled each observation.

Table 1. *Percentages of pupils recalling phenomena associated with effervescent powder (see the five phenomena listed above)*

Phenomena	Recalled (%)
1	*100*
2	*53*
3	*35*
4	*70*
5	*50*

Table 1 shows that the pupils recalled the five phenomena to different degrees. All pupils recalled the first phenomenon (the substances). These responses suggest that attention varied across the stages of the experiment. Only about half of the pupils recalled dissolving the three substances in water (phenomenon 2). I may not have drawn enough attention to this step. In future lessons, I should give each step appropriate emphasis. Phenomenon 3 may be difficult to interpret without a background in chemistry. Pupils may notice the fizzing without recognizing it as gas evolution. The low recall rate may reflect this difficulty. Phenomenon 4 (addition of the indicator) was recalled by 70% of pupils. The visible color change may have made this step particularly memorable. Only 50% recalled the final observation (the effervescent powder). I found this a little disappointing, as effervescent powder was actually the focus of the lesson. The pupils mainly described what they "did": they mixed the three substances, dissolved them in water, and tasted them carefully.

Only three of the 40 pupils mentioned all five phenomena. The first phenomenon was described by all pupils. Every pupil recalled at least one observation; two recalled only one, and three recalled two. These responses suggest that pupils do not attend to or remember experimental phenomena in a uniform way.

I was also surprised by some unexpected responses, such as "Guildo Horn[4]. We made fizzy drinks and examined the individual substances" (boy, 15 years old). Many pupils remembered the activities but could not recall the specific phenomena. The experiment was conducted as a hands-on activity by the pupils themselves. Direct participation, however, did not ensure that their observations were accurately retained. Some responses concerning

[4] Guildo Horn is a German pop singer who distributed and ate Nussecken (a German pastry) during his performances. This became a distinctive feature of his performances.

gas formation were more encouraging. Fourteen pupils (35%) recognized the "fizzing" as gas evolution; one suggested that the gas might be carbon dioxide (see Table 2).

2.4. Results: Interpretations

I expected the pupils to interpret the experimental phenomena as follows:

Table 2. *Expected scientific interpretations of the five phenomena*

Phenomenon	Interpretations
1	*Characteristics of the substances (substance concept)*
2	*Dissolving the substances in water does not distinguish them*
3	*Gas formation*
4	*Acid–base reaction*
5	*Mixing the ingredients to produce effervescent powder*

I compared the pupils' interpretations of the five phenomena with these expected interpretations. Figure 1 presents the proportions of correct and incorrect responses.

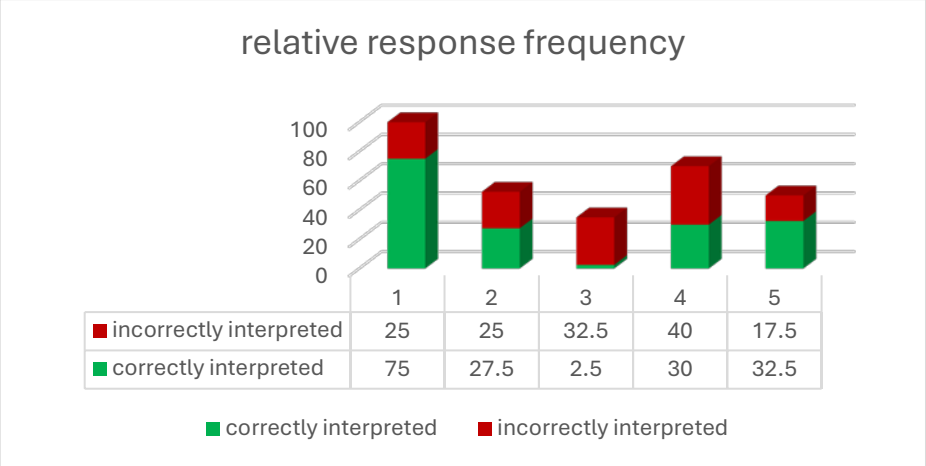

Figure 1. *Correct and incorrect interpretations of the five phenomena (%; N = 40; see Table 2)*[5]

Figure 1 illustrates differences in how pupils interpreted the five phenomena. Phenomenon 1 (the **substances**) had the highest proportion of correct interpretations, whereas phenomenon 3 (**gas evolution**) had the lowest. The balance of correct and incorrect interpretations also varied across phenomena. Three quarters of the pupils correctly interpreted the first observation by identifying and naming the substances. Although roughly half recalled dissolving the substances in water, only about a quarter interpreted this observation correctly. A pupil stated: *"Dissolving the three substances in water doesn't allow for any distinguishing characteristic, since all substances dissolve in water. If you mix all three substances in water, it fizzes, and a gas (perhaps carbon dioxide) is released."* Most incorrect interpretations concerned the third phenomenon. This may reflect the difficulty of connecting familiar **fizzing** with the scientific concept of **gas evolution**. The **indicator reaction**, by contrast, was readily noticed and remembered, probably because the color change was clearly visible. However, pupils had not yet developed a clear chemical

[5] I thank Christian Bader, a former colleague and head of computer science at a comprehensive school in North Rhine-Westphalia, Germany, for revising the tables and figures.

explanation linking the color change to changes in the substances. Some pupils could name the product but did not identify it as a "**fizzy drink**." They limited themselves to saying: "We mixed the stuff, filled it with water, and then tasted it" (15 pupils). None of the pupils interpreted every phenomenon correctly. The pupil who explained gas evolution did not describe or interpret the addition of the indicator.

These findings highlight the interplay among subject matter, pupil orientation, lesson planning, and implementation in chemistry education. I had planned the lesson to give every pupil a clear understanding of how effervescent powder is made. I also tried to show that the processes involved—dissolving, gas evolution, and color change—are all examples of chemistry.

2.5. Jens Muenzel's Summary

This investigation of pupils' behavior showed me how important feedback from pupils will be in my teaching career. The observations from my lesson revealed difficulties that 14- and 15-year-old pupils had with basic chemical concepts. I was surprised that some apparently clear phenomena were not consciously noticed. Effective teaching involves not only planning and implementing a lesson but also attending to pupils' responses. As a preservice teacher in my first practicum, I found it difficult to recognize this feedback during the lesson. This experience made me aware that I need to develop this ability.

I therefore recommend introducing a practicum semester after the second semester of teacher education. This would allow students to reflect earlier on the different dimensions of teacher behavior.[6]

3. Notes from the supervising chemistry education specialist (Hans-Juergen Becker)

The 40 pupils perceived and recalled the chemical phenomena in markedly different ways (see Tables 1 and 2 and Figure 1). During his practicum, Jens Muenzel encountered the challenge of helping all pupils notice the important observations and interpret the effervescence in scientifically meaningful terms. Their interpretations varied considerably. Research across educational contexts has documented the prevalence of misconceptions and everyday explanations of chemical processes among young learners. Such conceptions can create difficulties in understanding even relatively simple phenomena.

In his contribution, Jens Muenzel identifies several issues central to chemistry didactics:

- Difficulties in understanding chemical concepts such as "reaction" and "gas evolution," as distinct from everyday descriptions such as "change" and "fizzing";
- Pupils' engagement with chemistry lessons;
- The motivational and cognitive effects of hands-on experiments;
- The organization of subject knowledge and its relevance to classroom learning;
- Pupils' willingness to engage in practical, hands-on activities;

[6] The introduction of a school-based orientation practicum early in teacher education has been debated in Germany for decades.

- Instructional design principles, including simplification, variation, flexibility, and clarity;
- Interactions among factors influencing instruction; and, above all,
- Teachers' ability to observe and interpret pupils' behavior during instruction.

The report illustrates a central challenge in chemistry teaching. Learners without chemical training may struggle with concepts that seem straightforward to experts, even when they can observe and manipulate the materials directly (see Figure 2). Muenzel himself was surprised by this finding.

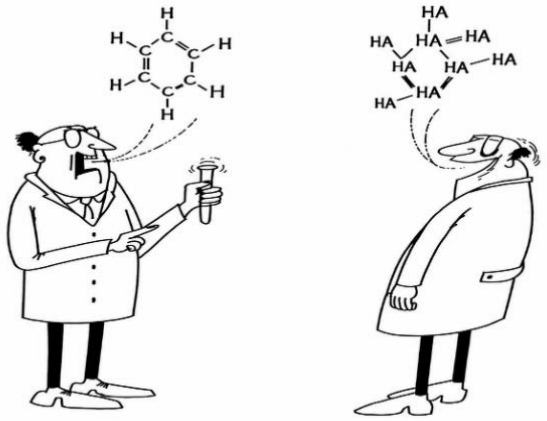

Figure 2. *Dialogue between a chemistry novice and an expert*

Direct experience of classroom situations during a practicum can help preservice teachers develop attentive, responsive teaching behavior that takes pupils' learning difficulties into account (Becker & Nguyen, 2014a, 2014b). In his report, Muenzel reflects repeatedly on his own behavior, although he did not always respond to situations as they arose. His carefully planned classroom activities complement the theoretical knowledge acquired in lectures and may help him develop greater flexibility, confidence, and competence in reflection-in-action and reflection after teaching. The student advocates for the explicit inclusion of the topic of "teacher behavior" in the subject-specific chemistry didactics curriculum. Indeed, since the summer semester of 2010, the regulations for the chemistry didactics program at the University of Paderborn have included a separate seminar on teacher behavior within the main program of study (semesters 5–8). The seminar enables students to reflect on their classroom behavior, exchange experiences, and explore theoretical questions with peers and instructors. A collection of materials titled "*Teacher Behavior in the Classroom—Analysis of Beginning Students' Difficulties"* (University of Paderborn) supports these discussions with research literature, statistical data, and other resources.

The student's engagement was high. His reflection connects classroom observations with his interpretations of the results. The terms “perception” and “observation” are not always clearly distinguished, and some pupils may merely glance at an event without attending to or remembering its significance. The analysis did not examine differences by gender.

Evaluating the report also requires attention to its use of scientific concepts and statistical summaries. The combined chart and table display the proportions of correct and incorrect interpretations for the five phenomena. A considerable number of learners did not interpret phenomena 2–5. The percentages of missing responses must be inferred from the display rather than being shown explicitly. The numerical findings are interpreted in relation to the classroom situation, sometimes using a heuristic rather than a strictly statistical approach. If students develop this habit of relating evidence to practice during university study, they may strengthen their professional capacity for ongoing self-reflection. Muenzel was disappointed that the final preparation of the effervescent powder received relatively little attention. The characteristic fizzing occurs only when water is added to the mixture, triggering the chemical reaction. This simple experiment illustrates the importance of interactions between substances and water in chemistry. After discussing the lesson with him, I gained the impression that he had understood this chemical principle intuitively but had not reflected on it during the lesson. A teaching practicum offers opportunities to encounter classroom realities, interpret them, and learn to respond in the moment. I consider this particularly valuable when preservice teachers explore scientific ideas through discovery learning or guided research questions (Bruhn, 1997; Schmidkunz & Lindemann, 2006).

The higher education teaching approach of “research in teaching” can, in principle, be applied to all content within the chemistry education program and can be integrated into lectures and, especially, seminars without substantial additional resources. Research-oriented activities have long been part of chemistry education.

The students were free to choose their own content. They generally selected topics relevant to their experiences or interests. Their topics included pupil orientation, teacher behavior, attitudes toward chemistry, environmental issues, experiments, conceptual learning, general education, educational media, and learning psychology. In 2017, chemistry teacher trainees from HCMUE participated in an event as part of German Day, organized by the German Consulate General in Ho Chi Minh City and held at the Saigon Zoo. An activity involving 130 Vietnamese children examined how they explored substances through their senses. The preservice teachers analyzed the children’s observations and interpretations (Becker et al., 2018). In the winter semester of 2018/19, Vietnamese students examined the requirements of a chemistry curriculum grounded in everyday life, considering the relationship between the structure of chemical knowledge and pupils’ learning needs (Becker, 2020). Within the framework of the chemistry methodology research seminar “Exploration of International Chemistry Examinations” at Ho Chi Minh City University of Education (Lecturer: Dao Thi Hoang Hoa, summer semester 2026), student groups compared

Vietnamese examination regulations and content requirements with those of the United Kingdom, Australia, and Switzerland. The six groups presented their comparisons on posters, which, in my view, demonstrated what they had learned from this activity. They discussed differences, evaluated the approaches, and sought feedback during the final session. I attended the detailed presentation of their findings.[7, 8]

My experiences and findings concerning the "research in teaching" approach

- have been published in numerous works, often coauthored with students;
- have appeared as student research reports (e.g., Becker, 1995),
- have been presented in regional and national lectures;
- have been discussed with chemistry teachers in professional development courses;
- have informed practical reports and materials for chemistry education seminars;
- have been discussed across disciplines in colloquia supported by the German Chemical Society (GDCh)

These activities have continued for approximately 40 years.

The approach may also help evaluate chemistry teacher education, including in Vietnam. Teacher educators receive qualitative feedback on their programs. Student self-evaluations suggest that, although research-based activities are initially challenging, students generally value what they learn from them.

These reports can themselves serve as research material because they reveal preservice teachers' attitudes, implicit beliefs about chemistry teaching, patterns of behavior, and metacognitive reflections. Studying student teachers' behavior therefore offers another perspective for chemistry education research.

Developing professional teaching behavior remains a central objective of chemistry teacher education.[9] This objective is also consistent with key principles of Vietnam's 2018 education reforms.

4. Conclusion

Chemistry didactics is an action-oriented field. It must both examine teaching practice critically and prepare preservice teachers to act effectively in real classrooms. A central concern is teachers' behavior, including their competence in "reflection-in-action."

[7] I thank Dao Thi Hoang Hoa, a PhD student and lecturer in chemistry methodology at HCMUE, for carefully translating the English abstract and keywords into Vietnamese.

[8] At present, the concept of "research in teaching" has not received strong emphasis in Vietnamese teacher education. However, it could encourage preservice teachers' inquiry, reflection, and professional learning. The findings may inform further development and implementation of "research in teaching" in chemistry teacher education at HCMUE. The specific setting and timing of the project do not determine the applicability of the approach. The approach could be applied in other contexts, including Vietnam. Reflective teaching has been explored among Vietnamese teachers in previous case studies (see Pham et al., 2023). The accounts of 15 English teachers are discussed here without independent validation.

[9] See the annual trend reports "Subject-specific didactics of chemistry" in the journal "Nachrichten Chemie", published by the German Chemical Society (GDCh) since 2004.

Related ideas were already being discussed in Germany in the 1960s. “Theorizing in teaching situations,” or reflecting while acting, allows teachers to adjust their lessons as circumstances change. Such flexibility can reduce the gap between theory and practice. Nevertheless, even carefully planned lessons cannot be predicted in every detail. This uncertainty is a fundamental challenge for a science of teaching.

Chemistry teaching and education can, of course, be studied systematically, including through descriptive investigations. I have supervised three doctoral studies examining fundamental questions of chemistry teaching and education in Germany.

The “research in teaching” approach shows how reflective teaching behavior can be developed. It also brings to light the situational demands of teaching and the difficulties encountered by beginning teachers. In Europe, the idea of didactics as an art has a long tradition. Attending carefully to the teaching situation can inform new instructional decisions, particularly when learners participate actively.

Learners might also participate in planning lessons. In this sense, planning itself becomes part of teaching. This possibility lies beyond the scope of the present report.

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

REFERENCES

Becker, H.-J. (1978). Video recordings as a means of training and verifying the experimental skills of student teachers within the framework of subject-specific didactics training. In H. Hallstein (Ed.), *Festschrift for Prof. Dr. W. Göttel by his friends and colleagues*. Pädagogische Hochschule Berlin.

Becker, H.-J. (1989). Teacher behavior as a task of chemistry didactics: Typical difficulties faced by Berlin student teachers during their teaching practicum. *Praxis der Naturwissenschaften – Chemie*, *38*(5), 39–42.

Becker, H.-J. (1995). Research in teaching: In the teaching practicum. Introduction to the chimica study report by Stephan Maaß, Language in chemistry lessons. Practicum experiences with language difficulties between teachers and pupils. *Chimica Didactica*, *21*(2), 61–70.

Becker, H.-J. (2020). Commercials as part of daily life situations: Impulses for chemistry teaching and for methodical reflections of MS-course students of the Ho Chi Minh City University of Education/Department Chemistry in Nov./Dec. 2018 (Part 1). *Ho Chi Minh City University of Education Journal of Science*, *17*(5), 936–949.

Becker, H.-J., Arendt, R., Busse, J., & Cordes, S. (2005). The Paderborn teaching approach “Research in teaching”, students present study achievements: Report on a lecture as part of the GDCh training for chemistry teachers. *Die Wilde 13*, *10*(19), 9–12.

Becker, H.-J., Do, H. T. M., Hoang, K. L., Nguyen, T. A. K., Nguyen, T. T. N., Tran, L. N. A., & Nguyen, M. Q. (2018). Sensual accesses to chemistry (Part 2). *Ho Chi Minh City University of Education Journal of Science*, *15*, 5–14.

Becker, H.-J., & Folwaczny, S. (2010). Pupil orientation and the "new" G-8 curriculum: Student competencies and teaching processes. *Praxis der Naturwissenschaften – Chemie*, *59*, 35–38.

Becker, H.-J., & Karst, J. T. (1993). Introductions to chemistry lessons: Routine already established during training. *Naturwissenschaften im Unterricht – Chemie*, *4*(17), 44–45.

Becker, H.-J., & Lehmann, C. (1997). Practical experience in teaching: Students analyze student lesson plans. *Zeitschrift für Didaktik der Naturwissenschaften*, *3*(2), 59–69.

Becker, H.-J., & Nguyen, M. Q. (2013a). Chemistry teaching and science of education in Germany. Part 1: Aspects of chemical education in Germany. *Ho Chi Minh City University of Education Journal of Science*, *48*(82), 25–33.

Becker, H.-J., & Nguyen, M. Q. (2013b). Chemistry teaching and science of education in Germany. Part 2: Pupil-orientation. *Ho Chi Minh City University of Education Journal of Science*, *50*(84), 38–45.

Becker, H.-J., & Nguyen, M. Q. (2014a). Chemistry teaching and science of education in Germany. Part 3: Our experiences against the background of our chemistry didactical understanding. *Ho Chi Minh City University of Education Journal of Science*, *54*, 18–28.

Becker, H.-J., & Nguyen, M. Q. (2014b). What is a good chemistry teacher?! It depends on the teacher. *Ho Chi Minh City University of Education Journal of Science*, *62*, 17–30.

Bruhn, J. (1997). Learning process studies in subject-specific didactics seminars. In H. Behrendt (Ed.), *Society for Didactics of Chemistry/Physics Conference 1996* (pp. 137–139). LIT.

Heimann, P. (1962). Didactics as theory and doctrine/teaching. *Die Deutsche Schule*, *54*, 407–426.

Klaetsch, H. (2002). *The application of Gestalt principles to the construction of chemical experimental apparatus*. Staccato.

Pham, T. T., Nguyen, T. A., Phuong, Y. H., Nguyen, T. H., Huynh, T. T. A., & Le, T. T. (2023). Vietnamese teachers' perspectives of the impact of reflection-on-action teaching on educational quality: A grounded theory study. *Vietnam Journal of Education*, *7*, 195–206.

Schmidkunz, H., & Klaetsch, H. (1996). On the influence of background colors on the visual perception of chemical experimental setups: An empirical study. *ChemieKonkret*, *3*(3), 120–122.

Schmidkunz, H., & Lindemann, H. (2006). *The inquiry-based teaching method: Problem solving in science education* (6th ed.). Westarp Sciences Publishing.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

HỌC SINH NHẬN THỨC CÁC HIỆN TƯỢNG VẬT CHẤT NHƯ THẾ NÀO VÀ DIỄN GIẢI CÁC QUAN SÁT RA SAO? VÍ DỤ: THÍ NGHIỆM TRỘN BỘT SỦI – MỘT BÁO CÁO NGHIÊN CỨU CỦA SINH VIÊN TRONG KHUÔN KHỔ NGHIÊN CỨU LÍ LUẬN VÀ PHƯƠNG PHÁP DẠY HỌC

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TÓM TẮT

Phương pháp đào tạo giáo viên theo định hướng nghiên cứu trong dạy học góp phần bồi dưỡng cho sinh viên các năng lực như tư duy độc lập, năng lực phản tư trong hoạt động dạy học, cũng như khả năng phân tích và lí giải các hiện tượng nảy sinh trong dạy học và giáo dục hoá học. Đặc biệt, trong các đợt thực tập sư phạm, sinh viên có cơ hội lần đầu vận dụng những kiến thức lí thuyết nền tảng vào việc xây dựng kế hoạch và thiết kế bài học hoá học. Những tình huống cụ thể, thường thể hiện qua sự khác biệt hoặc mâu thuẫn giữa kế hoạch dạy học và thực tiễn triển khai bài giảng, được sinh viên nhận diện, tìm hiểu và phân tích dựa trên nhu cầu nghề nghiệp thực tế của bản thân. Qua quá trình đó, sinh viên từng bước hình thành hoặc tái cấu trúc hiểu biết về sư phạm chuyên ngành. Đồng thời, họ ngày càng biết nhìn nhận và đánh giá thực tiễn dạy học trên cơ sở tri thức lí thuyết đã tiếp thu – yếu tố được xem là điều kiện quan trọng cho sự phát triển năng lực nghề nghiệp của giáo viên. Theo kinh nghiệm thực tiễn và phản hồi từ sinh viên, việc giảng dạy phương pháp dạy học hoá học và nghiệp vụ sư phạm hoá học trở nên sâu sắc và hiệu quả hơn khi chú trọng khai thác thực tiễn dạy học thông qua việc phân tích, báo cáo và thảo luận về các bài học hoá học đã được triển khai trong thực tế.

Từ khóa: hành vi của giáo viên; hành vi của học sinh; hướng dẫn phương pháp làm việc khoa học; lí luận và phương pháp dạy học đại học; mối quan hệ giữa lí thuyết – thực hành; năng lực của giáo viên; nhận thức của sinh viên