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Analysis of Cognitively Activating Tasks in Vocational Education and Training of Nursing

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Abstract

Context: So far, it is unclear to what extent cognitively activating tasks are used in vocational education and training in nursing.
Approach: In the mixed method study, carried out at the University of Münster, the Fliedner University of Applied Sciences Düsseldorf and the Leuphana University Lüneburg (all Germany), nursing teachers (n=20) were interviewed about their leading task design criteria. Furthermore, learning tasks (n=20) from everyday nursing lessons were analysed regarding their potential for cognitive activation. Preliminary work is used for task analysis in which a further differentiated subject-didactic category system has been developed to assess the cognitive-activating potential of tasks in the vocational training of nursing. With seven dimensions, this first instrument enables a differentiated assessment of the cognitive potential of tasks in the vocational training of nursing.
Findings: The findings so far show that only some of the nursing teachers are able to consciously construct cognitively activating tasks while observing the necessary subject-didactic requirements. Two first types are described.
Conclusion: In the future, task construction should be discussed in more detail in nursing teacher education.

Keywords: cognitive activation, tasks, quality of teaching, nursing, Germany

1 Introduction

Cognitively activating tasks, which learners deal with independently during work phases, are indicators of high teaching quality (Klieme, 2019). So far, it is unclear whether cognitively

activating tasks are used in vocational education and training (VET) of nursing (Wesselborg, Weyland & Kleinknecht, 2019). However, high-quality teaching can prepare students for the increasingly complex supply needs and new tasks in the health care system (Bartels, 2005).

The construct of cognitive activation is primarily conceptualized by using challenging tasks, which encourage students to engage in deeper learning activities and to develop an elaborate knowledge of the learning subject (Klieme, 2019). Nevertheless, the use of cognitively activating tasks is tightly linked to the specific subject matter (Praetorius et al., 2014) and needs to be conceptualized for the unique specifics of each domain.

Up to now nor the construct of cognitive activation nor the potential of cognitive activation of tasks in nursing education have been researched. However, challenging tasks can foster students´ deeper thinking and domain-specific problem-solving skills to meet the increasingly complex care needs of patients (Bartels, 2005; World Health Organization (WHO), 2011).

Against this background, the project[1] „Analysis of learning tasks in the vocational education and training in nursing under the focus of cognitive activation" aims to gain insights into the quality of tasks and the pedagogical content knowledge of teachers. To reach this aim, the following research questions were outlined:

1. Which criteria are described by nurse teachers in VET of nursing to design cognitively activating tasks?
2. What potential for cognitive activation do tasks in VET of nursing contain?
3. What connection exists between the criteria described by nurse teachers in VET of nursing to design cognitively activating tasks and the actual design of tasks?

2 Cognitive activation and cognitively activating tasks

In Europe, one of the most known theoretical frameworks for high-quality teaching assumes three basic dimensions which impact student´s learning: classroom management, supportive climate and cognitive activation (Praetorius et al., 2018). The framework is based on strong empirical clues, which indicate the relevance of the three dimensions in education research (Klieme, 2019). Cognitive activation is conceptualized as a multidimensional construct, which illustrates the complexity of tasks used in class and the depth of learning processes (Baumert et al., 2010).

The construct of cognitive activation is mostly operationalized through the use of challenging tasks. They should encourage students to engage in deeper learning activities and to develop an elaborate knowledge of the learning subject (Klieme, 2019). Given the empirical fact that the features of a task do not directly indicate the cognitive processes, the construct is referred to as the potential for cognitive activation. Hence, the cognitive activity of students is not measurable and has to be explored approximatively. Education research assumes that the construct of cognitive activation can be explored through the analysis of tasks (Baumert et al., 2010), video-based observations of classes (Klieme et al., 2009) and student-surveys (Rieser et al., 2016).

The construct of cognitive activation has in particular been found to predict student‘s achievement (Baumert et al., 2010; Decristan et al., 2015). The TIMSS Video Study (Trends in International Mathematics and Science) found a positive impact of cognitive activation on learning performance in the subject of mathematics (Klieme et al., 2001). The study also showed that tasks are often used to solely reproduce knowledge and to practice routine procedures in mathematics (Klieme et al., 2001). The project „Cognitive Activation in the Classroom" (COACTIV) showed that cognitive activation in mathematics is a significant predictor for increased learning outcomes (Baumert & Kunter, 2013a). Fauth et al. (2014) point out that

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from a student's perspective, the construct of cognitive activation is associated with joy and interest in a subject. Furthermore, less motivated students can also profit from cognitively activating classes because it fosters the use of metacognitive strategies (Rieser et al., 2016)

For some time now, there has been a repeated demand for a subject-specific operationalization of cognitive activation. In fact, it was shown that cognitive activation not only varies through the course of different lessons but also depends on the specific subject taught (Praetorius et al., 2014). Furthermore, the different dimensions of teachers' professional knowledge are often associated with student learning outcomes (Baumert & Kunter, 2013b).

In connection with the construction of tasks, the pedagogical content knowledge of the teachers is of great importance and often associated with student learning outcomes. Pedagogical content knowledge involves the knowledge of subject-specific tasks, like the construction of tasks with multiple solutions, explanatory knowledge, like the capability to explain different ways to address problems and the knowledge of students' subject-specific thinking, like the typical mistakes students make (Baumert & Kunter, 2013b).

However, the domain-specific variances in cognitive activation are fundamental concepting cognitive activation. In mathematics, for instance, tasks that have multiple solutions are highly cognitively activating (Neubrand et al., 2013), while in reading classes, the imparted reading strategies refer to cognitive activation (Lotz, 2015).

Important in the context of cognitive activation is Bloom's taxonomy, that describes the complexity of thinking processes on the basis of cognitive psychology (Bloom, 1956). The revised taxonomy of educational goals by Anderson et al. (2001) is applied both in academic education and VET (Winther & Achtenhagen, 2009). In VET, the characteristics of especially challenging and, thus, potentially cognitively activating tasks include findings related to the development of specific competences and skills as well as an increase of complexity regarding the necessary steps to achieve the solution of a domain-specific problem (Walker et al., 2016).

3 Cognitively activating tasks in VET of nursing

In Germany, vocational training in nursing is regulated by national professional legislation (Pflegeberufegesetz, 2017). Nevertheless, due to the federal system, there are further laws and regulations in the federal states, e.g. on the regulations for nursing teachers and their education. Furthermore, the late academization of nursing teachers (Wesselborg & Bögemann-Großheim 2019) means that nursing teachers with different qualifications and courses teach at nursing schools. However, several theoretical didactic theories in nursing education in Germany were developed over the past 20 years. Nevertheless, these concepts require empirical recording and differentiated supplements (Darmann-Finck, 2015).

A leading approach in nursing education curricula in Germany is the use of meaningful and exemplary nursing situations that include key occupational issues (Darmann-Finck, 2010). These situations are reflected in a didactic manner and processed into case studies. These reflect central issues and contradictions in the nursing sector. The situations include multiple, often divergent perspectives, e.g. between patients and caregivers. In addition, the used situation should allow multiple interpretations of the situation itself, the needs of those involved, and the given structural requirements (Darmann-Finck, 2010). Case studies involving ethical dilemmas (Darmann-Finck, 2010) or interprofessional collaboration and decision-making processes (Wesselborg et al., 2019) are particularly challenging for nursing students.

Case studies are the basis of the learning activities in nursing education and therefore a crucial factor in the design of challenging assignments. The competent creation and application of case studies and the associated tasks are an essential part of the pedagogical content knowledge of teachers in vocational training in nursing. Didactically the use of case studies is justified by the increase of complex care situations in which nurses cannot rely on normative knowledge only but need to understand the experiences, needs, attitudes and expectations of

patients to ensure highly qualitative care (WHO, 2011) and to develop flexible problem-solving skills (Currey et al., 2018).

Wesselborg, et al. (2022) developed a subject-didactic category system to analyse the potential for cognitive activation in tasks in nursing vocational training (Table 1). This takes up general didactic features of cognitively activating tasks (Kleinknecht et al., 2011) in order to design a domain-specific elaboration. With seven dimensions, including an adapted form of the revised taxonomy of educational goals (Anderson et al., 2001). The instrument allows a differentiated assessment of the cognitive potential of tasks in nursing professional education and shows a good reliability.

Table 1

*Subject-didactic category system to assess the potential for cognitive activation of tasks in VET of nursing; (*Wesselborg, Kleinknecht, et al., 2022)

Dimensions	Rating			
Knowledge	Factual Knowledge	Procedural Knowledge	Conceptual Knowledge	Metacognitive Knowledge
Cognitive Process	Reproduction	Close transfer	Broad transfer	Problemsolving
Knowledge Unit	One	Up to four	More than four	
Openness	Defined/convergent	Defined/divergent	Undefined/divergent	
Relation to living and professional environment	None	Constructed	Authentic	Real
Linguistic complexity	Low	Medium	High	
Forms of representation	One	Integration	Transformation	

The category „relation to living and professional environment“ is presented as an example. Case studies with professional situations should form the basis of the learning activities in nursing education. This is an important factor when designing challenging tasks. There are four ways to evaluate tasks in the context of this dimension. It could be a task that has no relation to the living and working environment. In this case, the task does not contain a link between theoretical knowledge and nursing students' experiences in professional practice. The second dimension means that the situation described is obviously constructed and not authentic. In this case, little information is given. The third dimension is going to be evaluated when the described situation is described with more complex information and e.g. combines different perspectives (patient, caregiver, family). The fourth dimension is going to be evaluated when the tasks present an authentic situation and the nursing students have to plan a realistic challenge - like a celebration in a nursing home.

Preliminary results when analysing the potential for cognitive activation in tasks in nursing vocational training (Wesselborg et al., 2022) suggest that tasks are often reproductive or have simple cognitive activating structures. Tasks rarely invite students to engage in full engagement with the case study or engage in deep learning activities to gain a full understanding of the subject matter.

Therefore, the current study provides an important contribution to the further development of education research in VET of nursing in Germany.

4 Methods

The study is conducted in a mixed methods design. An ethics vote was obtained in preparation for the study. The sample included 20 nursing teachers who work at nursing schools in North Rhine-Westphalia and hold a master's degree in nursing education. Problem-centered interviews were conducted to examine the professional knowledge of task construction (Witzel, 2000). For this purpose, a semi-structured interview guide was created that contains questions about the construction criteria used by the teachers when creating cognitively activating tasks. Furthermore, the interviewed nursing teachers provided case studies and learning tasks (n = 20) from everyday lessons, which were assessed in relation to their potential for cognitive activation.

The interviews were analysed deductively. The dimensions of the category system for surveying the cognitive potential of tasks were used as the central categories. In addition, inductive categories were formed (Mayring, 2019) to find further subject-specific aspects of cognitive activation. To analyse the tasks, the subject-didactic category system to assess the potential for cognitive activation of tasks in VET of nursing (Wesselborg, Kleinknecht et al., 2022) was used. The results from the different research approaches were then triangulated and compared for similarities and differences (Denzin, 1989). Through this procedure, the connection between the criteria described by nurse teachers in VET of nursing to design cognitively activating tasks and the actual design of tasks was disclosed, and comprehensive case summaries for each nursing teacher arose. At the end of the evaluation, a type formation is planned.

5 Results

5.1 Criteria of nurse teachers in VET of nursing to design cognitively activating tasks

The Following are two meaningful case summaries presented to illustrate different types of teachers in nursing vocational education. In the summaries, the nursing educator's criteria for designing cognitively activating tasks are presented. In addition, the interview results are described in connection with the analysed tasks.

Teacher A provides a case study and related assignments. The situation revolves around a middle-aged man with chronic heart failure. In addition, the concerned family is described. The patient requires specific care, while the family needs support in dealing with the chronically ill family member and the challenges that this entails.

Teacher A describes several criteria that he takes into account when designing challenging assignments in nursing education. Initially, Teacher A focuses on imparting Facts knowledge about a specific topic, and as the lesson progresses, the nursing students are asked to apply that knowledge to the present case study. For example, after learning the specific symptoms of chronic heart failure, nursing students should recognize these symptoms in the case study and distinguish them from symptoms of other diseases. Teacher A explains: *„[…] how can I apply my acquired knowledge to a concrete case study? […] Well, my point is obviously the pathology of a particular disease itself, but also the application to the case study. But first, the pathophysiology is addressed in the case study and not the care".*

In addition, for Teacher A, the inclusion of domain-specific models and theories in the case study is important for a successful learning process. In this specific case, it's the Corbin and Strauss trajectory model for chronic illness: *„And now it's important to me that the groups assess the care needs of this particular man [...]." And explicitly make a plan, like the support and counselling of the family should be planned at home using the model".*

Teacher A finds the use of models and theories particularly challenging for nursing students and, therefore, potentially cognitively activating. Especially when a transfer is required, and the models have been introduced in a different context. Therefore, Teacher A's goal is to *„connect old and new knowledge through a task".*

Teacher A considers some of his tasks to be solvable in a variety of ways since the nursing students can independently set priorities in their work. As a result, teacher A comes to the conclusion: *„[...] Various aspects can be worked on in the tasks. [...] With reference to the phases of the trajectory model, the students develop different support offers. Or, given the specific care needs of the patient, one student might look at a very different problem with the patient and pursue a creative solution than another student".*

The tasks Teacher A uses are partially divided into several steps or segmented by using tables to reduce complexity. According to Teacher A, this way, students receive *„a better overview of the topic"* and are more likely to put *„a structure to elaborate the case study"* into practice. In contrast, Teacher A also designs tasks which invite nursing students to be *„creative in their work process"* by deliberately leaving out any structuring elements or guidelines.

Teacher B provides assignments related to a case study that is an emergency scenario. In this situation, a nursing student called an emergency doctor for an acutely ill patient. The emergency doctor must first diagnose the symptoms of the patient's imminent deterioration and initiate the correct treatment measures.

Teacher B states that the tasks are *„rather rudimentary"* - i.e. begin with little information. First, the trainees should explain terms and indications for medicines. *„[...] Part One is relatively simple, the language is also similar."* Tasks, however, require the nursing students to *„think for themselves what they would do in this particular situation".* In addition, the language becomes more medically demanding when the emergency doctor arrives. At this point, Teacher B uses subject-specific terms such as „diuretics and 40 mg furosemide IV". […] All in all, it is becoming more medical".

Teacher B focuses in the case study on routine practice in an emergency situation, so the related tasks comprise medical techniques like palpatory blood pressure measurement and ECG monitoring. Moreover, a picture of an ECG-derivation showing a left bundle branch lock is integrated for the nursing students to examine. Teacher B points out the multiple facets of present information: *„[...] all of this needs to be processed first."*

Of utmost importance for Teacher B is the fact that there are always diverse interpretations of a situation present in nursing. Therefore, simple reproduction of knowledge is not sufficient in professional care. A deep understanding of learning matters and analytical practice have to be exercised in VET of nursing. Teacher B explains that in nursing, moments occur when a practitioner cannot explain certain actions and stresses their point of view as follows: *„That too [...] yes intuition, hermeneutic understanding. To the question: 'Why are you making this decision now?' 'I don't know, I can't tell you spontaneously. Ask me tomorrow, I can't tell."*

5.2 Pedagogical content knowledge of nurse teachers in VET of nursing

Regarding the pedagogical content knowledge of nursing teachers, Teacher A has a profound knowledge of the current regulations for professional training in nursing (Pflegeberufegesetz, 2017). It is, therefore, of great importance for teacher A to include the current legal goals of the training in his tasks. *„For me, these tasks are about covering all areas of competence that are easy to cover in nursing training, but also in the nursing profession."* Consequently, teacher A considers anatomy, physiology and pathophysics to be necessary knowledge bases, but above all wants nursing knowledge and nursing activities put in the foreground. Therefore, in the case studies created by Teacher A and the associated tasks, different protagonists with sometimes different perspectives as well as different care settings with special framework conditions play a major role. In particular, according to Teacher A, *„topics that are*

underrepresented in nursing vocational training, such as outpatient care" and advising relatives or caring relatives should be taken into account in the learning opportunities.

For Teacher A, the planning of a comprehensive and individual nursing plan, including evidence-based nursing knowledge, is a particular challenge for nursing students and, therefore, cognitively activating in nursing vocational training.

Teacher B emphasizes the importance attached to anatomical and physiological knowledge for nursing students. For Teacher B an important goal when designing case studies and challenging tasks is that the nursing students recognize the connections of diverse risk factors with multiple diseases, the interdependence between these diseases and the anticipation of presumably following pathological consequences. Regardless, classes should still be *„fun"* and *„light"*.

Concurrently, Teacher B wants the nursing students to reflect on existing contradictions in care situations: *„Well, to balance and endure dissonances or to make decisions for me accordingly. To pull myself out of the situation that are not good for me or in which I am not good for others. I find it difficult to get someone there."* Therefore, Teacher B develops case studies themselves and has already declined case studies from the school curriculum when their claims are not met. Teacher B wants to create *„images in the heads of the students, to connect the case study with their reality. […] I want to spark concern."* For this purpose, Teacher B uses clichés and irritating traits to characterize the protagonists of a case study. *„So these two fat old people with their sick vessels and their sick hearts, both chain-smoking here and all. So to speak, I always exaggerate here now, I stigmatize them now, I don't discriminate against them, but I stigmatize them very strongly now. And then, I open the textbook, and it's about advice and guidance in the context of nutrition. And what now?"* When asked where the inspiration for the case studies comes from, Teacher B could not name a certain source, only intuition and feelings guide the *„spinning of case studies"*.

Teacher B finds ethical dilemmas and issues that appeal to or irritate nursing student values to be extremely challenging for nursing students. He also interprets anatomical topics such as the central nervous system as a demanding domain-specific topic and is, therefore, cognitively activating in professional nursing training.

Teacher A is able to state explicit domain-specific criteria to design cognitively activating tasks in VET of nursing, especially the use of transfer tasks are repeatedly mentioned. Through the course of the interview, it becomes clear that Teacher A uses their preferred cognitively activating criteria in a flexible way and modifies the dimensions dependent on the learning sequence and on the current year in VET of nursing: *„Well, I'll put it like that, the further we are into the topic, but also in VET itself, the more complex and the more diverse the range of the tasks get."* So Teacher A describes how they begin the lesson with a focus on the reproduction of factual knowledge, which over the course of the lesson, has to be transferred and transformed to conceptual knowledge on the topic at hand.

The desired learning goals are also a central component for teacher A when varying the dimensions for designing demanding tasks. For example, tasks with a higher degree of openness are often used when Teacher A wants to encourage student nurses to discuss possible solutions: „[…] the integration of openness, because there are no concrete solutions but multiple solutions. Strictly speaking. So everyone can participate and contribute their experiences."

The statements of Teacher A show high agreement with the results of the interview and the tasks analysed with the didactic category system for assessing the potential for cognitive activation. The case study and the associated tasks show rather cognitively activating results in the dimensions „knowledge" and „cognitive transfer". The tasks become more and more complex and thus cognitively activating in the course of the lessons. Appropriately, the „openness" dimension shifts from a rather low level with several defined and convergent tasks that have clear

instructions for action and only one possible solution, to more divergent tasks that can be processed in a variety of ways.

Teacher B does not report any explicit domain-specific criteria for the design of cognitively activating tasks in nursing vocational training. He explains: *„I use things that I once learned in a very traditional way. [...] I've been here for eleven years now. It's been a while since I graduated. I, well, intuition I would call it now. And fun."* The only criterion explicitly mentioned for the design of cognitively activating tasks is the consideration of different levels of difficulty when designing several tasks for the same case study in order to maintain flexibility in the lesson: *„[...] so that those who are already further not get bored or I can then somehow push them further [...], but it doesn't necessarily have to be at this point."*

Although not specifically mentioned by Teacher B, the case study and associated tasks provided by Teacher B demonstrate several cognitively activating criteria. According to Teacher B, the first tasks have a low potential for cognitive activation, while as the case study progresses, some tasks also have an increasing potential for cognitive activation. The last task, for example, which reads: „What's actually going on with Rolf?" achieves high ratings in the didactic category system for assessing the potential for cognitive activation. The task requires conceptual knowledge, broad transfer skills, and two to three process steps and leaves room for different solutions. Therefore, the use of domain-specific cognitively activating criteria to design tasks of Teacher B is identified as implicit.

6 Conclusion

The results show that nurse teachers regularly use case studies to design tasks and adjust these to their prioritized learning goals. When asked about design criteria to design cognitively activating tasks, the included nurse teachers weren`t always aware of specific dimensions that are connected to the concept of cognitive activation. When confronted with relevant dimensions based on the subject-didactic category system to assess the cognitively activating potential of tasks in VET of nursing, most teachers were able to apprehend the presented dimensions. Furthermore, most of them can categorize their tasks alongside these dimensions and therefore analyse the cognitively activating potential.

These results hint at a gap between explicit and implicit knowledge of nursing teachers in the field of relevant dimensions to foster cognitive activation of nursing students and domain-specific criteria to design cognitively activating tasks. Nevertheless, the subject-didactic category system to assess the cognitively activating potential of tasks in VET of nursing seems to contain relevant domain-specific dimensions. Prospectively, these dimensions can be utilized by nursing teachers to increase or decrease the potential for cognitive activation in learning tasks in VET of nursing. Thus, the results of this study contribute to creating an adaptive learning setting in VET of nursing.

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