

Yijun Zhou

Cognitive Requirements of Accounting Tasks

A Task Analysis in Chinese Vocational School Textbooks

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1 Introduction

1.1 Problem statement

Since publishing the first PISA report¹ in 2001 and its associated educational monitoring, “competence orientation” has become a defining element of the educational science and subject didactic discussion in German-speaking countries (Reusser, 2014b; Reinfried, 2016, p. 5). Competence orientation denotes an orientation towards subject-specific, or domain-specific competence acquisition (Hartig & Klieme, 2006), which leads to a fundamental understanding of the didactic action orientation: teaching and learning should not be restricted to simply imparting content, expertise or exercising predefined skills. Instead, they should be based on the intertwining of experience and action, reflection and action, perspective, and implementation (Reusser, 2014b, p. 333). This consensus was also reached in the field of vocational education. In Germany, the concept of “competence-oriented” was reinforced by the amendment to the Vocational Training Act² (Berufsbildungsgesetzes) in 2005, which identified vocational action competence (berufliche Handlungsfähigkeit) as a critical objective of vocational education and training. Since then, competency orientation has been established as the guiding principle for curriculum development, didactic design, and the orientation of examination (Euler, 2020, p. 206).

In this background, tasks are considered the “transmission belts” to implement the reformed educational standards (Maier, Kleinknecht, Metz, Bohl, 2010, p. 84). Although the classical role of tasks has never been absent from the didactics discussion (Thonhauser, 2008), they were enriched with a new value and normative standard in the context of “new task culture” resulting from the TIMSS study³ (Baumert & Lehmann, 1997). Competence-oriented didactics aim to develop (the) subject-specific competencies and interdisciplinary competence in the school system (Weinert, 2001; Lersch, 2010), in which tasks structure the teaching-learning process and make it visible (Keller & Bender, 2012; Kleinknecht & Lankes, 2012; Maier, 2012). Afterward, discourse on competence-oriented tasks was associated with the studies on cognitive activation and their findings (Kunter, 2013). A “cognitive-activating task culture” represents a central aspect of competence-oriented instruction quality, especially when it comes to challenging learning goals, such as problem-solving skills (Bohl, Klein-

1 PISA 2000 was an internationally standardized assessment of reading literacy developed and carried out by 43 countries and administered to 15-year-olds in schools. The second cycle in 2003 focused on mathematics; the third in 2006 focused on scientific literacy (Fischer et al., 2005, p. 310).

2 According to §1 Abs. 3 BBiG, vocational training shall impart the occupational skills, knowledge, and abilities (occupational competence) required for the performance of a qualified occupational activity in a changing world of work in an orderly course of training. It shall also enable the acquisition of the necessary professional experience (translated). Access to: https://www.gesetze-im-internet.de/bbig_2005/_1.html

3 The TIMSS assessment was the first in a 4-year cycle to evaluate trends in students' mathematics and science achievement. TIMSS video study developed a detailed classification system (Neubrand, 2002), that provided a basis for the COACTIV project (Neubrand, Jordan, Krauss, Blum & Löwen, 2013, p. 129).

knecht, Batzel, & Richey, 2012; Klieme, 2018). Tasks that promote competence development are often characterized as highly-demanding and challenging and cause cognitive conflict (Lipowsky, 2009; Kunter & Voss, 2011; Minnameier & Hermkes, 2014), while, at the same time, they are problem-oriented (Reusser, 2006) and closely linked to real-life situations (Grell & Grell, 2010). They usually contain multiple solutions (Kauertz, Löffler & Fischer, 2015) and potentially conflicting perspectives of interests (Reusser, 2013). This set of task characteristics is apparently related to cognitivist and constructivist claims. Concludingly, competence-oriented tasks promote a deeper conceptual understanding in subject learning (Blum & Wiegand, 2000; Greefrath, 2004), prevent inert knowledge, and accelerate sustainable development and expansion of subject-specific and interdisciplinary competencies (Müller, Gartmeier, & Prenzel, 2013, p. 133).

Meanwhile, in competence measurement, the effective recording and capture of competencies by measurement instruments, i. e., tasks, are also one of the purposes of the “New Task Culture”. In the background of the European Qualifications Framework⁴ and the output-oriented assessment of the education system, the performance of vocational education and training systems is also inevitably coming under scrutiny. In this context, competence modeling within the various vocational domains plays a central role (Seeber et al., 2010; Winther & Achtenhagen, 2009; Winther, 2010; Schumann & Eberle, 2011). As an instrument for competence modeling, tasks are suggested to be designed in an ad-hoc approach (Hartig, 2007) according to a competence-oriented manner so that the identified competency structure and observed task difficulty can be interpreted in a meaningful way. Research on competence diagnostics tasks from a didactic perspective has been stepped up in this context. It requests, on the one hand, the standardized assessment results for comparison and performance evaluation; and, on the other hand, the reflective evidence for didactic improvement by recording the knowledge and skills of students in a criteria-oriented way (Hartig, 2007; Leutner, Fischer, Kauertz, Schabram & Fleischer, 2008; Kiper, Meints, Peters, Schlump & Schmit, 2010). Competence-oriented tasks, e. g., problem-solving tasks and authentic tasks, are intended to test learners' competencies and thus ensure compliance with the standards and facilitate competence-oriented management of the education system (Kleinknecht, 2019).

Against this background, a new research paradigm about the systematic analysis of task characteristics, especially the characteristics that could explain the task potential, which are also referred to as category systems or rating manuals, occurs in the German-speaking countries (Krüger, 2015). The evaluation system or categories mainly point to the cognitive requirements or cognitive support potential of the task in terms of competence orientation. Task analysis research was first fully developed in the mathematics didactics (Stein & Smith, 1998; Neubrand, Klieme, Lüdtke & Neubrand, 2002; Jordan, Krauss, Löwen, Blum, Neubrand & Brunner, 2008; Maaß, 2010). Task in languages (Nunan & Keobke, 1995; Knoch, 2011; Hartig, 2007; Abraham &

4 The introduction of the European Qualifications Framework (EQF) in 2012 and the German Qualifications Framework (DQR) in 2013, the objectives of which include the making the competencies acquired through training transparent and internationally comparable, has given further impetus to this development.

Müller, 2009; Bremerich-Vos, 2008), physics (Leutner, Fischer, Kauertz, Schabram & Fleischer, 2008), science (Reinfried, 2016; Prenzel, Häußler, Rost & Senkbeil, 2002), information (Schlüter, 2009), and general discipline (Maier et al., 2010; Blömeke, Risse, Müller, Eichler & Schulz, 2006) have also been subsequently reviewed. A few contributions to the study of task categories in the field of economic and commerce training come from Seeber (2008), Winther (2010), Schumann and Eberle (2011), but they are mostly exclusively focused on competence model construction. Tasks in the accounting domain have not been sufficiently inspected in any case, except for the work by Ernst (2012) and Thoma and Schumacher (2018).

However, this review in the accounting domain is both necessary and urgent. On the one hand, accounting knowledge has been an indispensable element of commercial thinking and action for centuries (Preiß & Tramm, 1996, V). It works to control, plan, and document the money and service flow generated by the operational business process (Coenberg, Haller, Mattner & Schultze, 2016, p. 5). Through accounting records, a company's economic status and profitability can be described accurately, and the business strategies for company development can be supported by professional evidence from accounting. Accounting reports serve as the foundation for communication with all owners, investors, and banks (Klein & Küst, 2020, p. 83). On the other hand, accounting work is facing a dramatic change. Accounting computerization is arriving with unstoppable digital momentum: leading to the gradual replacement of traditional accounting work, e. g., manual bookkeeping, by the automated process. Besides, the vast amount of data obtained through automated processes needs to be better organized, analyzed, and visualized. Accountants now are requested to cooperate with colleagues from different departments. All the above changes pose a challenge to traditional accounting work and demand the upgrade competence profile in accounting training. However, the accounting subject has long been considered reform-resistant (Reinisch, 1981; 1983; Achtenhagen, 1990). Compared to other economic and business domains, accounting didactics are uniformly oriented in terms of content selection, structuring and sequencing, and the design of teaching-learning processes. They are subject-oriented and essentially shaped by the textbook (Tramm, Hinrichs, Langenhaim, 1996, p. 1).

This situation also exists in the Chinese accounting training. This constitutes the first research momentum for this study. Accounting training in China has long been criticized for its strong discipline orientation and knowledge-based didactics (Zhang, Liu, Chi & Kuang, 2019). The constructive development of accounting didactics with competence-orientated claims works more as the catchword without sufficient empirical evidence⁵. Therefore, a systematic examination, specifically based on the competence-orientation, should be conducted for the tasks used in accounting training in

5 A consensus has been reached in the Chinese vocational education academic community on a competence-oriented purpose in vocational education curriculum reform. Vocational competencies are considered as critical principles in transfer work tasks into working profiles, teaching standards, and curriculum content (Xu, 2017). The concept of vocational competencies has also been emphasized in some of the most recently developed professional teaching standards and materials development (Xie & Yu, 2018), but there is still a lack of evidence on how to implement competence-oriented instruction in accounting.

Chinese vocational schools. This could significantly facilitate the development of competence-oriented standards in subject-specific didactics.

The second impulse is “A Trial Implementation of the Outline of Basic Education Curriculum Reform” issued by the China Ministry of Education (MoE) in 2011, which intends to change the situation of over-centralized curriculum management with implement three-level curriculum management at the national, local, and school levels, and improve the applicability of curriculum and textbooks for local schools and students (Xiao & Guo, 2018). In the vocational education system, the textbook management system follows the same regulations. The government encourages different participants in society (industries, enterprises, and schools) involved in textbook compilation procedures to emphasize the supportive role of education for local economic development. The emergence of many textbooks has provided a massive source for accounting instruction but also led to an uneven quality of textbooks (at the same time). It has been empirically proven that the quality of the teaching material and its content influence the success of teaching-learning processes (Helmke, 2009, p. 82). Therefore, objective evaluation criteria of textbooks should be implemented for monitoring the didactic quality of vocation training. The central position of the task in teaching and learning provides an appropriate insight for this intention since aspects of teaching planning, implementation and evaluation are ultimately bundled into tasks and often organized with the help of textbooks (Gerdsmeier, 2004; Meyer, 2003; Stein, 1992). This means that the systematic analysis of tasks can provide a meaningful inspection of teaching materials and didactic quality.

The third element of research impulse concerns teachers’ perceptions of the cognitive requirement of tasks. Since tasks play a central role in subject didactics, it is part of the core professional activities of teachers to assess the quality of tasks and use them in a targeted manner (Büchter & Leuders, 2006, p. 1). To systematically evaluate task potential and avoid the danger of talking past each other, teachers need a perspective or category that contributes to the professionalization of the subject discourse, in which tasks and their requirements in subject didactics can be conducted systematically.

The present study is informed and driven by these research impulses. The possibility of transforming these intentions in accounting training is currently pending exploration due to little empirical evidence. Particularly in China, the discussions on tasks in economics and the business domain were criticized for their insufficiency ten years ago (Zheng & Gerdsmeier, 2010) and the situation persists into the present day. Such shortages lead to the dilemma of developing and monitoring the accounting didactics in vocational training in China. To fill this gap, this study aims to inspect the accounting task quality in textbooks for secondary VET schools⁶ in China according to the competence-oriented standards, i. e., the cognitive requirements, and provide the empirical evidence for improving these accounting didactics. The study will focus on

6 After the completion of junior (lower) middle school, students can choose to enter either general (academic) senior secondary school or secondary vocational school. Secondary VET programs last 3 or 4 years. The age of students is 15–18. The next training program is the tertiary VET program (age 18–20). Secondary vocational school and tertiary vocational school are two main bodies of the vocational education system in China.

answering three main questions: How to systematically assess the cognitive requirements of accounting tasks (momentum I)? To what extent do textbooks on different levels support competence-orientation in accounting subject, i. e., what cognitive level of accounting tasks are provided in three-level textbooks (momentum II)? And how do accounting teachers perceive and diagnose the cognitive requirement of accounting tasks (momentum III)?

1.2 Study design

The following presents the study design (see fig. 1). The first part is about a theoretical argumentation and a review of existing research on the cognitive requirements of the task, particularly in the subject of accounting.

The theoretical part (Chapter 2) aims to critically argue for the legitimacy and applicability of the concept of cognitive requirement in task analysis in the subject of accounting. To apply the standard of the cognitive requirement to the assessment of tasks in accounting more reasonably, several points needed to be discussed in depth:

- Is it proper to apply the concept of cognitive requirement and its operational category to assess the task for the purpose of competence didactic and competence measurement in the accounting domain?
- What are the theoretical fundamentals for the tasks with different levels of cognitive requirements?
- What implications can be derived from the existing discussion about cognitive-related features of tasks in subject didactics?

The knowledge gained from theoretical argumentation helps to construct the category for empirical explorations. A theoretical justification for the application of the concept of the cognitive requirement to task analysis in accounting opens the possibility to applying the analysis classification into accounting tasks and evaluating the extent of their cognitive requirement. For this purpose, the four textbooks that are most frequently used in the accounting training at secondary vocational schools in China were selected from three levels, i. e., national, regional, and school-based textbooks. By means of structure content analysis within the examined categories, all accounting tasks in the Financial Statement chapters across four selected textbooks were analyzed as objectives for inspecting their cognitive requirement. Based on the result of task analysis, evaluating the quality of different accounting textbooks also becomes possible. Accordingly, the first empirical research (Chapter 4) aims to answer the following key questions:

- What is accounting tasks' overall performance from Chinese vocational textbooks according to the criteria of cognitive requirement?
- What are the typical characteristics of accounting tasks on a different degree of cognitive requirement?
- What is the performance of the four accounting textbooks according to the cognitive requirement criteria?

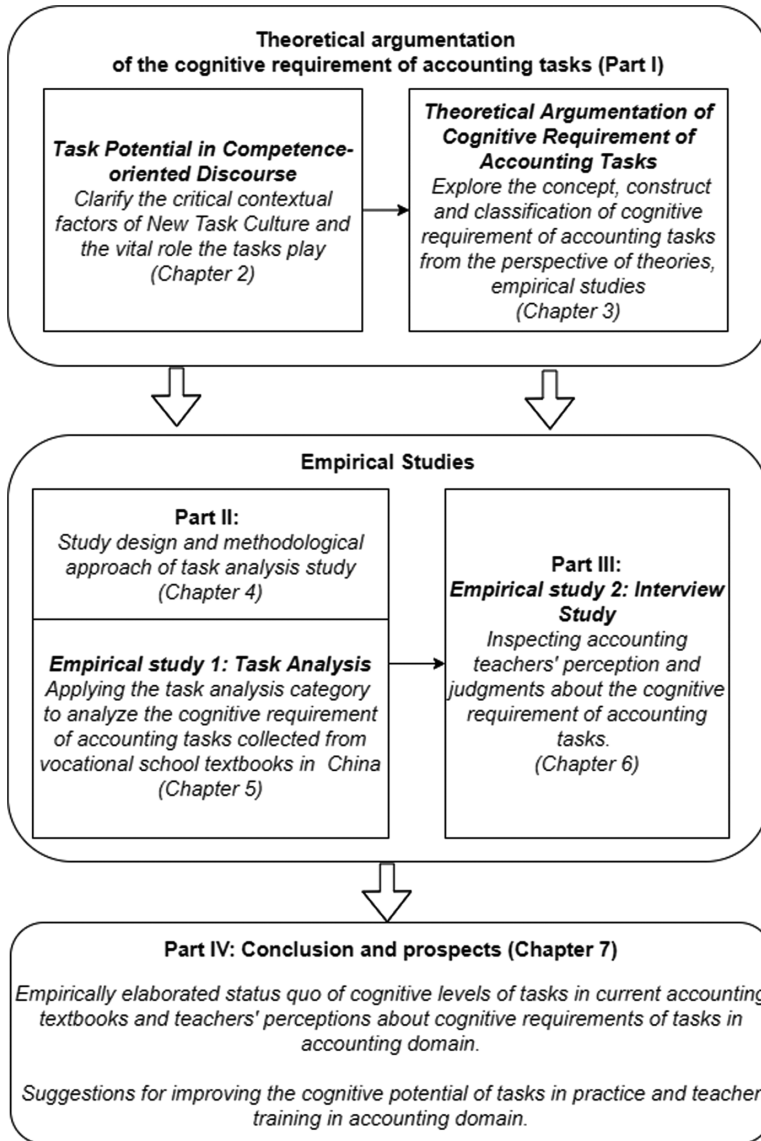


Figure 1: Study design

As a result of empirical study 1, the status quo of the tasks on current accounting textbooks concerning their possibilities for cognitive activation in accounting learning is thus determined. Besides, constructing a category system for cognitive requirements also allows encountering the second (set of) empirical research. Accounting teachers' diagnosis and interpretation of the cognitive requirement of accounting tasks are investigated in the second empirical study. The selection and arrangement of tasks are the subjective reconstructions of normative traditions and future-oriented

design achievements that depend on the professional competence of the teachers, which relates to their epistemological convictions, subject-didactic knowledge, and not least on their subjective theories about teaching and learning in the subject (Jordan, 2006 p. 11). It is inevitable to involve teachers' overall judgment of the cognitive level of accounting tasks, for example, based on what features lead to tasks with different cognitive levels. This is a meaningful supplement and extension to the concept of the cognitive requirement of tasks.

Inspecting the teachers' perception of the cognitive requirements of the accounting task, on the one hand, confirms the applicability of the theoretical-driven task analysis framework in the field of instructional practice and, on the other hand, increases the teachers' knowledge of the subject-specific tasks. The leading research questions are:

- Are teachers' judgments about the cognitive requirements of accounting tasks consistent with those based on the task analysis category?
- Based on which criteria do accounting teachers perceive the cognitive requirements of tasks?
- Does the teachers' task perception influence their judgment of the task?

To answer these questions, accounting teachers are requested to rank two groups of accounting tasks in terms of their cognitive level. As follows, a semi-structured interview is applied in this explorative study. One can expect to get rich but unstructured information from teachers' judgments about the tasks because the scientific theories about the cognitive requirement of tasks in a specific domain are absent in teacher education and training in China. Most teachers do not have systematic knowledge about the task from their studies or training. In this situation, a subjective theory is highly likely to be developed by teachers, allowing them to justify their actions during class (Edmondson, 1998). Hence, an explorative study could reveal sufficient information about accounting teachers' interpretation of the cognitive requirement of tasks. The results of the second empirical study are expected to provide insight for instructions in the subject of accounting.

A standard regarding reliability and validity in the study is followed. Firstly, standard translations between Chinese and English languages are conducted in the study (5.2.4), ensuring the accuracy of research procedures and interpretation results. The coding process in empirical study 1 is undertaken by two separated coders independently in pre-study to ensure the inter-consistency of analysis. For this, a Chinese vocational school teacher who teaches in the accounting domain with three years of teaching experience and good English proficiency participates in the double-blind translation and coding process. The results of the textbook task analysis and teachers' interview are finally summarized and lead to an outlook on outstanding research desiderata and other challenges.

1.3 Study procedures

Part I is comprised of the theoretical explorations. The potential of accounting tasks under the competence-oriented criteria has not been sufficiently studied, so first clarification of new criteria and their impact on the orientation of tasks is needed (Chapter 2). In section 2.1, the discussion focuses on the contextual factors that changed the normative discourse of the task. In section 2.2, the potential and expectation of tasks in competence-oriented discourse, especially in competence-oriented didactics and competence measurement contexts, were discussed.

Chapter 3 focuses on clarifying definitions and concepts of tasks. For the first desideratum of research, the question of theoretical rationality, delimitation, and operationalization of the concept of cognitive requirement arises. It is demonstrated in section 3.1 by further distinguishing the concept of task difficulty and complexity. The concept of the cognitive requirement was demonstrated in relevant theories, which is beneficial to the following operationalization empirically. Finding the main features that affect the cognitive requirement of an accounting task is the purpose in reviewing the literature about the cognitive requirement of tasks (section 3.3). In section 3.4, the applicability of the concept of cognitive requirements to accounting tasks is discussed. The discussion is currently in progress in the field of accounting training objectives, the features of accounting subject, and existing research on accounting tasks. Finally, a system category applicable to accounting tasks is constructed.

Part II aims to introduce the task analysis study and findings, in which Chapter 4 firstly explains the study design and methods of the first empirical study, i. e., task analysis study. Due to the study's intention being mixed with the purpose of exploration and examination, mixed-method research was conducted. First, the research purposes and questions of the study are stated (section 3.1.1), and the specific methods employed to answer them (section 3.1.2). Here, a brief justification of the structural content analysis and cluster analysis methods is presented. Furthermore, the approach to obtaining the object of analysis – tasks collection and textbooks for secondary vocational schools in the accounting subject is explained (Section 3.2). The pre-study results are presented in section 3.3, where the criteria, i. e., the validity and reliability of the coding instrument, are determined. In section 3.4, detailed steps of the analysis are introduced.

Chapter 5 introduces the results of the task analysis. First, a description of the accounting tasks situation, e. g., the content and format, is shown (section 5.1). Secondly, the overall cognitive degree of accounting tasks is clarified based on the coding results through structured content analysis (section 5.2). Thirdly, the profiles of task clusters with different cognitive levels and their corresponding cognitive characteristics that emerged from the clustering analysis are presented (section 5.3). Finally, four accounting textbooks that are widely-used for secondary vocational schools in China are analyzed and evaluated based on the distribution of accounting content, task format, and task clusters (section 5.4).

In part III, Chapter 6 combines the design and results of the second empirical study, i. e., the interview study. The study's objectives and the rationale for using an interview research method are first demonstrated (section 6.1). Since few studies have investigated Chinese accounting teachers' perceptions of the task, the exploratory approach is appropriate. The respondents' situation, interview instrument, procedures, and data preparation are introduced in the section of research methods (section 6.2). Section 6.3 presents the interview study results. In the interviews, accounting teachers' task sensitivity was inspected by asking them to rank the cognitive requirements of the two groups of sample tasks (section 6.3.1). Subsequently, semi-structured interviews were conducted to question their reasons for task ranking, and explore their analysis criteria for task ranking (section 6.3.2). Finally, the relation between teachers' task sensitivity and their strategies for analyzing the task is discussed (section 6.3.4).

In part IV, chapter 7 summarizes the research results and presents an overall reflection for subsequent action for improving the cognitive potential of tasks in the accounting training. Meanwhile, thoughtful criticism for the entire study is generated, as well as implications for accounting teachers' education and training in China.

**Part I. Theoretical Exploration: Cognitive
Requirement of Accounting Tasks**

2 Task Potential in Competence-oriented Discourse

2.1 Critical contextual factors: formation of competence orientation

Against the background of output-driven educational management (Klieme, 2003) and the evidence-centered educational research paradigm (Mislevy & Risconcente, 2006), the philosophy of competence orientation became a buzzword in German educational research discourse (Maier, Bohl, Drüke-Noe, Hoppe, Kleinknecht & Metz, 2014, p. 341), in which task plays a critical role in competence modeling and competence-oriented learning. A “New Task Culture” was created, leading to reflections on the task’s criteria in assessment and didactics fields. Therefore, clarifying the competence concept and the requirements set forth for tasks in competence measurement and competence-oriented didactics is a prerequisite to discussing the task’s criteria.

2.1.1 The concept and types of competence

An influential overview of different definitions of competence was clarified by Weinert (1999) in a report prepared for the OECD, in which, “competencies are understood as the cognitive abilities and skills available in or learnable by individuals to solve specific problems, as well as the associated motivational, volitional, and social readiness and skills to use the problem solutions successfully and responsibly in variable situations” (translated, Weinert, 2001, p. 27). Klieme and Leutner (2006) defined competence as a functional “context-specific cognitive performance disposition” that is experience-dependent and serves to “cope with demands in specific situations” (p. 879). From definitions of competence, several features could be drawn (Klieme, 2004; Hellman, 2016):

- competencies include not only knowledge but also other aspects such as understanding, ability, action, experience, and motivation. Competencies in the sense of motivational orientations are necessary for accomplishing challenging tasks,
- competence initially has purposeful and goal-directed characters. It enables individuals to cope with the requirements of different tasks,
- competence is domain-related and always manifests itself in specific situations,
- competence as a cognitive performance disposition must be distinguished from random actions that may occur without awareness,
- competencies are dependent on experience so that they can be developed and modified through training. This is the justification to derive and implement forms of support for the improvement of competencies.

In addition, Weinert (2001) distinguishes between the variants of competencies to clarify the connotation of competence (p. 28):

- Subject-specific competencies can be understood as specific expertise, i. e., knowledge of facts and theories, e. g., physics, language, and music.
- Interdisciplinary competencies refer to general methodological competencies, such as acquiring knowledge, rational working methods, problem-solving, argumentation skills, teamwork, and presentation techniques.
- Action competence, which in addition to cognitive competence, also includes social and personal, communicative, and emotional competencies. This means that one is capable of social interaction, cooperation, and communication. Furthermore, it enables individuals to realize their strengths and weakness and responsibly control their learning and work processes, and performance. In summary, action competence allows acquired knowledge and skills to be used successfully and responsibly in very different life situations.

In summary, competence orientation aims to enable students to acquire knowledge, skills, and attitudes (Ziener & Kessler, 2012, p. 21). Thus, not only subject-specific education should be of paramount importance, but also interdisciplinary competencies and action competencies (Reusser, 2014b, p. 326). These interdisciplinary competencies and action competencies should be acquired and consolidated within the context of all subjects. For this reason, the integration of these interdisciplinary competencies and action competencies is a leading teaching principle that should be considered in all subjects when designing lessons (Reusser, 2014b, p. 331).

2.1.2 Competence diagnostics: Competence modeling

2.1.2.1 Concept of competence modeling

The concept of competence, especially cognitive competence, was first operationalized in the field of assessment, in which competence modeling was constructed to facilitate and record the competencies empirically. As a result, three types of competence models were distinguished: competence structure models, competence level models, and competence development models (Abs, 2007; Lersch, 2010; Winther, 2010).

Competence structure models serve to organize different components of competencies. These models are constructed based on the theoretical assumption that different competencies or complex competencies can be recorded in a differentiated manner in a concrete requirement situation. Thus, with the help of competence structure models, it should be determined which and how many different competence dimensions can be differentiated (Klieme & Leutner, 2006, p. 883). In contrast to competence structure models, competence level models depict what level of demands can be mastered by the test person (*ibid*, p. 883). Thus, different levels of competence attainment focus on the hierarchy of competencies and are strongly related to the requirement situations. For this purpose, the requirements of the situations and tasks are analyzed in detail based on theoretical considerations and empirical research. It is to be deter-

mined to what extent the requirements must be fulfilled so that the lower, medium, or high competence level is met (Klieme, 2004, p. 12). The competence development model is primarily concerned with the mental models of experts and novices and their differences based on cognition-theoretical assumptions. It specifies the course of competency acquisition and thus could answer questions about the acquisition of competencies and then consequently be used as a planning model for teaching-learning processes. The competence development models aim to derive competence levels by analyzing the requirement situation and interpret the levels as qualitative differences based on developmental psychology (IPN, 2003, p. 18, Winther, 2010, p. 40).

2.1.2.2 Competence modeling in commercial and business training

With the process of Lisbon–Copenhagen, there is a stronger focus on the achieved qualification levels of the different programs of vocational education and training (VET) in European Union (EU) countries. The assessment of competencies obtained in VET programs has emerged as a critical issue for the development of workforces and the capacity for life-long learning and the fostering of civic participation as a responsible citizen (Seeber, 2016, p. 163). Although the concept of competence orientation is centered in the tradition of vocational education and training in Germany, it is now redrawing public attention because the empirical evidence does support performance outcome.

This is particularly evident in the large-scale competence assessment programs in German vocational education and training over the past 20 years, see, for example, the international comparative large-scale assessment for vocational education initiated in 2004 (VET-LSA: Baethge, Achtenhagen, Arends, Babic, Baethge-Kinsky & Weber, 2006; Baethge & Arends, 2008). The measurement focused on domain-specific, cross-occupational, and basic competencies required for successful participation in the economy and society in the twenty-first century. Other critical research programs are ASCOT (Technology-based Assessment of Skills and Competencies in VET, 2011–2014) and ASCOT+ (2019–2022), both initiated by the BMBF (Bundesministerium für Bildung und Forschung). The projects aim to provide empirical insights into vocational education and training by testing trainees' level of vocational competence with the support of technology-based instruments. Among the others, the general vocational competence and domain-specific vocational competencies of commercial, industrial-technical, and health and care are the foci (Beck, Landenberger, Oser, 2016).

The current contribution of vocational modeling in commercial and business training based on empirical evidence could be briefly summarized as follows:

- For the structural model of commercial competencies, evidence has identified the independence of competence structures within business domains, such as domain-related competencies, i. e., numeracy and literacy related to the commercial field, and domain-specific competence, i. e., the professional competence for accomplishing the tasks in the business field, such as production planning,

procurement, marketing, and sales (Winther, Festner, Sangmeister & Klotz, 2016; Seeber, 2016).

- For modeling economic competence, the evidence supports the independent structure of business competence, i. e., occupation-specific action competence, and economic competencies, i. e., economic-civic competence (Eberle, Schumann, Kaufmann, Jüttler & Ackermann, 2016).
- The problem-solving competence model for the commercial domain has been developed and validated based on the technology-based office simulation assessment scenario. Problem-solving competence was constructed as knowledge application, action regulation, self-concept, and interest. Studies reported that the strongest predictor of problem-solving competence is subject-specific factual knowledge, and other significant predictors are reading literacy and intelligence (Wuttke et al., 2015; Seifried et al., 2016).
- The current results of studies on the hierarchical level of commerce competencies show that competencies in the commercial domain can be empirically classified into four levels: work on economic tasks from everyday understanding and ideas; performance of simple economic or mathematical procedures and multi-step calculations with reasonable confidence; possession of conceptual and procedural economic knowledge, and development of algorithms and heuristics models for solving tasks; in-depth understanding of economic relationships and confident handling of instruments, rules and procedures in the domain (ULME: Lehmann & Seeber, 2007; Seeber, 2008).
- The progress of competence development in the commercial domain was described based on the changes in the structural composition of competencies. Findings stated that an incipient association of domain-specific and domain-related competence becomes apparent with the process of vocational training (Klotz, 2015).

In conclusion, significant partial aspects of commercial competence are clarified, and information about the construction and development of competence is provided. Competence models are essential for test constructors and serve to support teachers by helping to differentiate the content of the individual competencies. Thus, competence-oriented tasks can be used in the planning and design of teaching to create learning opportunities that serve to acquire the various partial competencies (Lersch, 2010, p. 7; Sterkl, 2017, p. 22).

2.1.3 Competence-oriented didactics: Competence development

2.1.3.1 Traditional teaching script vs. Competence-oriented script

Criteria for good teaching is the classic topic in education science. However, before the competence-oriented teaching script, the so-called “traditional teaching script” mainly focused on teaching content and the reproduction of learned knowledge. According to Lersch (2010), teaching and learning contents in the class followed school guidelines