



7. Cognitive Activation Potential of E&S Tasks at Commercial Vocational Schools in German-Speaking Switzerland

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Abstract This study focuses on tasks in Economy & Society used in a video study at commercial vocational schools and analyses the objective and realized cognitive activation potential. The results show that the objective cognitive activation potential is generally on a low to medium level and rarely changed through implementation in class. The insights of this study are useful for future teacher trainings.

Keywords cognitive activation potential | task analysis | video study | Economy & Society

INTRODUCTION

Teaching is largely characterized by solving and discussing tasks. Tasks are a means of organizing the subject matter, they are orientation points for teacher-student interaction, and they can be regarded as an object of learning effort (Jordan et al., 2008). Due to the high importance of tasks in teaching and in promoting competence, the use of qualitatively “good” tasks is a central element in teaching. In that regard, the concept of cognitive activation, which was first mentioned by Klieme et al. (2001), also plays an important role. According to this concept, students are encouraged to actively engage with the contents of a lesson and to deeply reflect them, which entails the “modification, expansion, interlinking, restructuring, or rebuilding of existing knowledge structures” (Kunter & Voss, 2013, p. 101).

There are three main methods to investigate cognitive activation (see Illustration 7.1) which can be embedded in an “offer-use-model” of teaching and learning

(Helmke, 2015); more specifically, a model, in which learning opportunities are offered and arranged by teachers and used by pupils to foster their competence development (Holtzsch, Brückner et al., 2019). Firstly, on the “offer side,” the objective cognitive activation potential (oCAP) can be examined by means of a task analysis (Jordan et al., 2006; Maier et al., 2010; J. Neubrand, 2002). Secondly, also on the “offer side,” the realized cognitive activation potential (rCAP) can be examined by means of a video study, where the implementation of the tasks in class is examined (Blömeke et al., 2006; Krauss et al., 2004). Finally, on the “use side,” the cognitive activity of students can be recorded by means of questionnaires (Leuders & Holzäpfel, 2011). The use of questionnaires can provide further informative results. This is because even though tasks may be referred to as the carriers of students’ cognitive activity (Jordan et al., 2006, p. 13), high levels of a cognitive activation potential may not always lead to higher activity, but also to cognitive overload (Batzel et al., 2014; Kirschner et al., 2006).

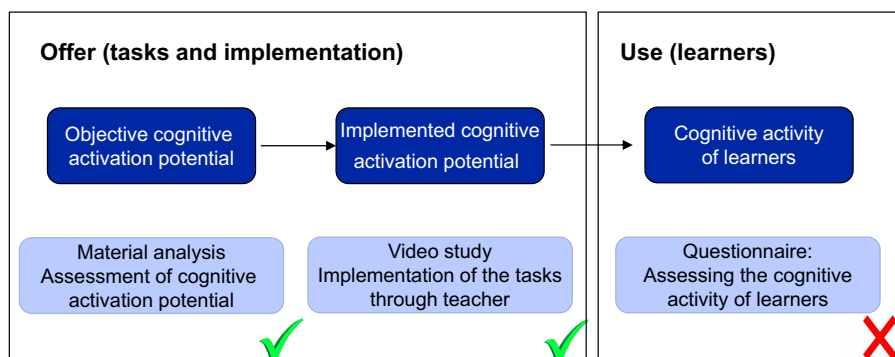


Illustration 71. Offer-Use-Model regarding the cognitive activation potential of tasks (own representation based on Helmke (2015, p. 71).

There are informative studies on the cognitive activation potential of tasks in various learning areas, especially in mathematics (selection: Blömeke et al., 2006; Hillje, 2012; Jordan et al., 2006; Kleinknecht, 2010; Klieme et al., 2001; J. Neubrand, 2002; M. Neubrand et al., 2013), but also in other subjects such as biology (Jatzwauk, 2007), physics (Schabram, 2007), reading instruction (Lotz, 2016), music (Gebauer, 2016), or religion (Pirner, 2013). Moreover, there are elaborated classification schemes with criteria to examine the oCAP of tasks (e.g., Jordan et al., 2006; Maier et al., 2010). Whereas these schemes provide valuable criteria, they also come with some disadvantages. Firstly, the schemes are based solely on a task analysis and lack a follow-up examination of the rCAP based on video data. Secondly, they follow an additive approach, according to which higher values repre-

sent a more cognitively activating task. However, such an interpretation is not always permissible, since cognitive activation also depends on the learning prerequisites of the students (Batzel et al., 2014; Kirschner et al., 2006).

There are also a few studies that assess cognitive activation holistically, meaning with task analysis, video data, and questionnaires. A study that examines the objective task quality (task analysis), the intended task quality (teacher's intention and justification of task choice) as well as the realized task quality (video recording of implementation in class) is that of Blömeke et al. (2006) in the field of mathematics. This study examines one task on the basis of one lesson and can thus be regarded as a first approach to a holistic task analysis with a subsequent video study. Larger studies where video data was used to examine the cognitive activation potential (CAP) were conducted for example in the subjects mathematics (Hillje, 2012; Kleinknecht, 2010) or German (Kleinknecht, 2010). However, such studies remain sparse and further research is needed to provide a holistic insight into the cognitive activation potential of tasks. Also, there has not been a study yet to analyze the cognitive activation potential in the subject economy. Especially with regard to the dimension "cognitive activation," it is, however, important to research every subject as it has been shown that this dimension is content-dependent (Praetorius et al., 2014, p. 8). Therefore, cognitively activating criteria in one subject cannot necessarily be transferred to another subject.

Consequently, this research desideratum is taken up in this study. Based on two self-developed manuals, this study pursues the qualitative analysis and description of both the oCAP and rCAP of tasks in the subject Economy & Society (E&S) at commercial vocational schools in German-speaking Switzerland from a holistic view. Specifically, the following research questions are examined:

1. How cognitively activating are the E&S tasks used at commercial vocational schools in German-speaking Switzerland (task analysis)?
2. How do the teachers at commercial vocational schools in German-speaking Switzerland influence the objective cognitive activation potential through implementation in class (analysis of task implementation)?
 - a. Regarding which cognitively activating criteria do teachers increase or decrease the cognitive activation potential of a task through implementation in class?
 - b. How do the teachers increase or decrease the objective cognitive activation potential of a task?

The following sections of this chapter focus on the literary background of tasks and the cognitive activation potential, the development of the coding manuals as well as the presentation and discussion and interpretation of the results.

COGNITIVE ACTIVATION POTENTIAL OF TASKS

Regarding cognitive activation, it is important that learners are adequately challenged based on their cognitive preconditions. This can be achieved by an appropriate level of instructional tasks and appropriate guidance by the teacher (Batzel et al., 2014, p. 160; Kleinknecht, 2010; Leuders & Holzäpfel, 2011, p. 216). This section first gives an overview of tasks in general and then specifies on the objective and realized cognitive activation potential of tasks.

Tasks

Tasks are an essential part of everyday teaching (Kleinknecht, 2010, p. 9; Straka & Macke, 2002, pp. 215–216) and are even considered as the most important student activity in class (J. Neubrand, 2002; Büchter & Leuders, 2005). For the teachers, tasks are a vehicle to organize the lessons and to influence students' learning and cognitive activity (Jordan et al., 2008, p. 85). The teachers can do so, on the one hand, through the selection and arrangement of tasks in a lesson and, on the other hand, through the implementation of these tasks in class (Jordan et al., 2008, pp. 85–86).

There are several definitions for tasks in literature. According to J. Neubrand (2002, pp. 16–17), tasks request students to process and solve a selected topic. According to Pahl (1998, p. 13), tasks are a request to students to perform a certain action, to answer a question, to solve a problem, to implement an instruction, to carry out an assignment, but also to take a decision and to ask questions themselves that help to illuminate a problem. Furthermore, Kleinknecht (2010, p. 12) defines tasks as being performed by students either alone, in pairs or in groups, whereas questions and requests that are asked in class are not considered to be tasks. In line with these given definitions, the present study regards tasks as requests to students to actively engage with a task, for example, by performing an action, answering a question, or solving a problem.

Objective and Realized Cognitive Activation Potential

With regard to the *objective cognitive activation potential*, several cognitively activating criteria can be found in literature. For example, tasks can be described as

cognitively activating if they are divergent (Maier et al., 2010) or if they request learners to link the content with their prior knowledge, transfer their knowledge to new situations, integrate tasks into their everyday life and offer several possible solutions to a problem (Jordan et al., 2006; Kunter & Voss, 2013, p. 102; Leuders & Holzäpfel, 2011; Maier et al., 2010). Another aspect of a cognitively activating task is if the task challenges existing concepts, thereby resulting in a cognitive conflict (Kunter & Voss, 2013; Minnameier et al., 2015).

While assessing the oCAP itself may be a necessary method to find out more about the potential of a task, it is not sufficient. This is because not only the tasks themselves but also their implementation in class (i.e., the *realized cognitive activation potential*) can affect students' learning. For example, the objectively determined cognitive activation potential of a task may be reduced by a small-step procedure in class and thereby not be fully exploited (Drollinger-Vetter & Lipowsky, 2006). On the other hand, teachers may also enhance the oCAP in class by providing or eliciting further cognitively activating information. Therefore, in order to examine the full cognitive activation potential of a task, it is important to also analyze the rCAP by doing a follow-up investigation using video data (Kunter & Voss, 2013, p. 102).

METHODS

This section focuses on the sample of this project as well as the methods used to develop the coding manuals for the task analysis (RQ 1) and for the analysis of task implementation (RQ 2).

Sample

This study is based on a video study, which was conducted in 2014 within the framework of LINCA (Learning and Instruction for Commercial Apprentices). LINCA is a Leading House project,¹ which was sponsored by Swiss SERI (State Secretariat for Education, Research and Innovation) and which examined the subject E&S at commercial vocational schools in German-speaking Switzerland. The research interest of the Leading House was the business competence of the students, the teaching perception in E&S lessons, and the professional competence of the teachers (Reichmuth-Sprenger, 2017, p. 116; Rohr-Mentele et al., 2018, pp. 33–36).

1 Leading Houses in Switzerland “contribute to the sustainable development of VET/PET [Vocational Education and Training / Professional Education and Training] research in Switzerland. Coordinated by one or more Swiss university chairs, each Leading House serves as a competence network and conducts research under the terms of a service level agreement with SERI” (SERI, n.d.).

Four major surveys (MS) were conducted between November 2012 and May 2015, in which 85² classes took part. The 85 classes were a random cluster sample from a population of 357 classes from 55 commercial vocational schools. After the second MS, nine classes and their teachers participated in a video study (Holtzsch, Reichmuth-Sprenger et al., 2019, pp. 335–336). Participation in the video study was voluntary and therefore not representative but exploratory in nature. Nevertheless, detailed investigation of a video study can be relevant, because video recordings tend to give a more comprehensive and objective picture of the reality of teaching than surveys and are less characterized by subjective assessments (Clausen, 2002, p. 49; Herrle & Breitenbach, 2016, p. 30). The video study took place between August and December 2014 during regular teaching hours. The commercial apprentices were in their fifth semester at that time and taught in economics.

The video study consisted of two, sometimes three, measuring points (MP) per class (see Table 7.1). The first MP was an introductory lesson into a new topic and the second MP an in-depth lesson on the same topic. The third MP was either an introductory lesson in another topic than or a further in-depth lesson on the same topic as MP 1 and 2 (Reichmuth-Sprenger, 2017, pp. 108–110). Since this last MP was inconsistent in terms of both completeness and structure, it was excluded from the general inspection and was used exclusively for piloting and developing the coding manuals. Therefore, the research object of this study is based on the tasks and video recordings of the first and second MP.

With regard to the number of tasks, 79 tasks in the first MP and 86 tasks in the second MP of the nine classes were analyzed regarding their oCAP. Regarding the rCAP, 37 tasks in the first MP and 60 tasks in the second MP of the nine classes were analyzed. The reason why the number for the rCAP is lower than the number for the oCAP is because only the tasks that were discussed in class during the video study could be analyzed regarding their implementation in class.

Table 7.1. Video study with nine E&S-classes in their fifth semester (Aug to Dec 2014)

Measuring point (MP)	Aim	Used for study	Number of tasks (oCAP)	Number of tasks (rCAP)
1	introductory lesson	√	79	37
2	in-depth lesson (same topic as MP1)	√	86	60
3	introductory lesson of new topic or further in-depth lesson with same topic as MP1	x		

2 Drawing in 2012 with a sample mortality of nine classes.

Data Collection

In order to develop the *coding manual for the task analysis* (short: *task manual*), a combination of deductive and inductive approaches was chosen (Döring & Bortz, 2016, p. 557). For the deductive approach, criteria of previous works (see section 0) were examined in order to ascertain whether they could be included in a task manual for the subject E&S. The inductive approach served to ascertain which criteria are considered cognitively activating specifically for the subject E&S. The latter approach involved four steps: (1) The tasks used in the video study were thoroughly analyzed and a sample of different tasks regarding form and requirements was selected. Based on this selection, (2) interviews with six E&S teachers, (3) think-aloud-interviews with six E&S learners and (4) expert interviews with four teacher trainers in E&S respectively Economics & Law (E&L) were conducted. Participation in the interviews was voluntary. The aim of the interviews with the E&S teachers, E&S learners and E&S and E&L teacher trainers (step 2 to 4) was to gain insight into the cognitive activation potential from different perspectives. Also, the initial plan was to conduct six interviews with each group of people (teacher, learners, and teacher trainers). However, due to declinations and cancellations, only four teacher trainers could be interviewed.

The interviews with the E&S teachers took place between August and October 2017 and served to identify further cognitively activating criteria specific to E&S from the perspective of experienced E&S teachers. The interviews lasted 70 to 90 minutes and involved two thematic priorities. Firstly, the teachers were asked to describe how they cognitively activate students in class themselves. Secondly, they were presented the selected tasks from the video study and asked to explain in detail whether they regarded those tasks as cognitively activating and to give reasons for their decision. The interviews were audio recorded and transcribed and evaluated using qualitative content analysis. The coding unit involved the answer to a question and the context unit involved the answers to several questions on the same topic (Mayring, 2015).

The think-aloud-interviews (Häder, 2015, pp. 402–403) with the six E&S learners took place in November 2017 and served to gain further insight into cognitively activating criteria from the learners' perspective. The interviews took around 90 minutes, in which the learners had to solve selected E&S tasks from the video study. While doing so, they were asked to talk aloud about how they proceeded. After each task, the learners were asked to reflect on the following questions: (1) what aspects of the task were challenging and to what extent, (2) which aspects made them think and how, and (3) what aspects did they consider as motivating or demotivating and why. Likewise, with the teacher interviews, the think-aloud

interviews were audio recorded, transcribed, and evaluated using qualitative content analysis. The coding unit involved the answer to a question and the context unit involved the answers to several questions on the same topic (Mayring, 2015).

The four expert interviews with the teacher trainers in the subjects E&S and E&L took place in December 2017 and January 2018 and served two purposes. Firstly, the teacher trainers were asked how they cognitively activate students in class themselves in order to gain further insight into cognitively activating criteria in the subject E&S. Secondly, they were given a draft of the manual, which was developed based on the deductive and inductive approach. The experts were then asked to evaluate the identified criteria with regard to their content-related fit to the subject E&S. These interviews were recorded via note-taking and evaluated using qualitative content analysis (Mayring, 2015). The experts generally assessed the fit as positive.

Similar to the task manual, a combination of deductive and inductive approaches was chosen to develop the *coding manual for the video analysis* (short: *video manual*). The deductive approach involved an analysis of previous works in order to examine and adapt methods to assess the rCAP. The inductive approach involved a thorough analysis of the E&S tasks and the LINCA video study in order to gain insight into how and to what extent teachers reduce and decrease the oCAP.

Data Evaluation

This section is divided into three sub-sections. The first subsection of “Data Evaluation” describes how the criteria in the task manual, which assesses the oCAP, were developed. The second subsection gives an overview of how the criteria in the video manual, which assesses the rCAP, were found. The third subsection explains the coding of the tasks used in the video study to assess the oCAP and rCAP.

Criteria and scales to assess the oCAP of E&S tasks

In order to examine which cognitively activating criteria can be used to assess the oCAP in E&S, a combination of deductive and inductive approach was used (see “Data Collection”). Based on the deductive approach (literature analysis), the following criteria were found (selection):

- “openness” (e.g., Klieme et al., 2001; Maier et al., 2010; J. Neubrand, 2002, pp. 136–137)
- “structuring” (e.g., Maier et al., 2010; Maier et al., 2014; J. Neubrand, 2002, p. 138)

- “prior knowledge” (e.g., Batzel et al., 2014; Hugener, 2008, p. 112; Jordan et al., 2006; Kunter & Voss, 2013; Maier et al., 2010)
- “type of knowledge” (e.g., Anderson & Krathwohl, 2001; Hillje, 2012, p. 96; Jordan et al., 2006; Lotz, 2016, p. 100; J. Neubrand, 2002)
- “cognitive process” (e.g., Anderson & Krathwohl, 2001; Bloom et al., 1972; Maier et al., 2010; Metzger et al., 1993)
- “reference to everyday life” (e.g., Hillje, 2012, p. 84; Kleinknecht, 2010, p. 103; Maier et al., 2010; J. Neubrand, 2002, pp. 112–115)
- “multiple solutions” (e.g., Baumert et al., 2009, p. 129, pp. 122–123; Jordan et al., 2006; J. Neubrand, 2002, pp. 136–138; M. Neubrand et al., 2013)
- “language complexity” (e.g., Hillje, 2012, pp. 69–70; Jordan et al., 2006; Maier et al., 2010; J. Neubrand, 2002, pp. 123–124)
- “forms of representation” – text, number, tables, graphs, etc. (Jordan et al., 2006; Maier et al., 2010, Maier et al., 2014; J. Neubrand, 2002, pp. 120–121)
- “direction of task processing” (e.g., Jordan et al., 2006; J. Neubrand, 2002, pp. 124–129)
- “cognitive conflict” (Hugener, 2008, p. 150; Kunter & Voss, 2013; Minnameier et al., 2015; Praetorius et al., 2018).³

With the exception of the criteria “multiple solutions,” “forms of representation,” and “direction of task processing,” all of the criteria above were mentioned by the E&S teachers and E&S learners in the interviews. This implies that several of the criteria used in other subjects to assess the cognitive activation potential can be transferred to the subject E&S. Moreover, in the interviews, many other criteria were considered to be cognitively activating with some of them being mentioned multiple times by several people, whereas others were only mentioned once by one person. Since it was neither feasible nor representative to include all the criteria brought up in the interviews in the manual, the following normative decision was taken: Deductively deduced criteria that were mentioned by at least a quarter of the interview partners ($n = 3+$) and inductively developed criteria that were mentioned by at least a third of the interview partners ($n = 4+$) were included in the manual. The reason why the threshold for the inductively deduced criteria was higher is because the criteria specific for the subject E&S are not supported in previous works due to the fact that the oCAP of E&S tasks has not been examined yet. Therefore, the threshold for these criteria was increased in order to gain a more representative result. Illustration 7.2 shows the final criteria to assess the oCAP, which were deduced from the deductive and inductive approach.

3 For further information on these criteria, see Table 7.2.

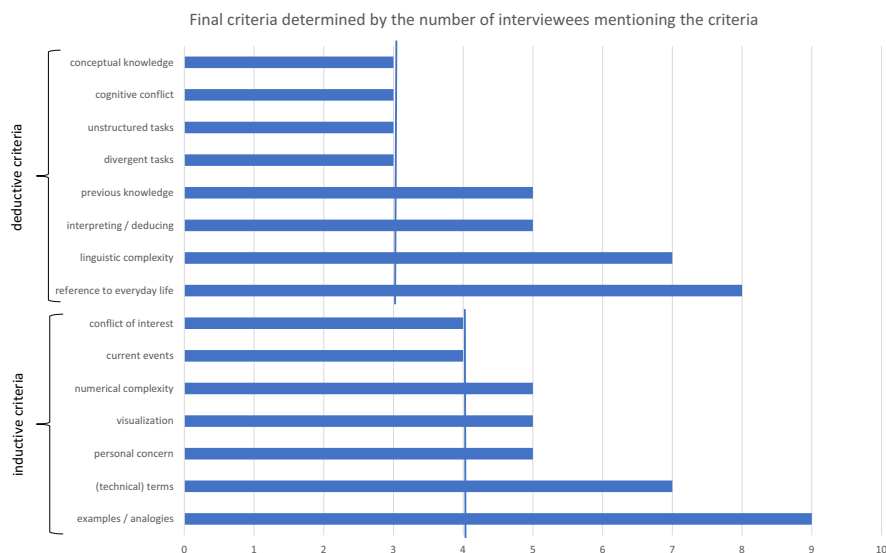


Illustration 7.2. Final criteria for the oCAP deduced from the deductive and inductive approach.

Note: The vertical lines represent the thresholds determining whether the criteria were included in the manual or not.

Out of the final criteria, some criteria had to be deleted because they could not be rated from an external perspective as they were too subjective (e.g., “sense of achievement,” mentioned by four interviewees). Other criteria had to be deleted because they were considered as demotivating among several students and, therefore, not conducive to the cognitive activation potential (e.g., “large amount of data,” mentioned by eight interviewees). Moreover, some of the criteria that were mentioned revealed similarities and thus were combined to a single criterion (e.g., “reference to everyday life” and “personal concern”; “examples/analogies” and “visualization”). The final criteria were presented to the four teacher trainers in order to discuss their fit. The teacher trainers generally regarded the fit as positive. Table 7.2 gives an overview of the final criteria of the task manual.

Table 7.2. Final criteria of the task manual

Criterion	Scale
Cognitive process (CP)	Remember knowledge Understand, interpret, summarize or deduce knowledge Create knowledge
Type of knowledge (TK)	Factual knowledge Procedural knowledge Conceptual knowledge
Cognitive conflict (CC)	No cognitive conflict Cognitive conflict
Conflict of interest (CoI)	No conflict of interest Conflict of interest; no opinion required Conflict of interest; opinion required
Prior knowledge (PK)	No prior knowledge required Prior knowledge required on a low level Prior knowledge required on a high level
(Technical) terms (TT)	Few (technical) terms (0–7) Some (technical terms (8–15) Many (technical) terms (more than 15)
Language complexity (LC)	No language complexity Language complexity on a low level Language complexity on a high level
Numeric complexity (NC)	No numeric complexity Numeric complexity
Reference to everyday life (RE)	No reference to everyday life Reference to everyday life Reference to everyday life with personal concern
Current events (CE)	No reference to current events Reference to current events
Examples (EX)	No examples Examples; processing of examples not required Examples, processing of examples required
Structuring (STR)	Structured task Unstructured task
Openness (OP)	Convergent task with one possible solution Convergent task with alternating solutions Divergent task

Scales and subscales to assess the rCAP of E&S tasks

The video manual is based on the criteria of the task manual and, therefore, contains the same criteria as the task manual but with different scales. More specifically, instead of scales to assess the degree of the oCAP, the video manual includes scales to assess how the oCAP is changed through implementation in class: (1) decreased; (2) remained unchanged; (3) increased. These three main scales were adapted from the study by Blömeke et al. (2006), who analyzed the oCAP and rCAP of one task in the subject mathematics.

Moreover, three subscales for the scale “decreased” and two subscales for the scale “increased” were added to the manual in order to assess how exactly teachers tend to reduce or increase the objective CAP. These subscales were developed based on a thorough analysis of the implementation in class (inductive approach). Table 7.3 shows the final version of the included scales and subscales in the video manual.

Table 7.3. Scales and subscales of the video manual

Scales	Subscales
oCAP decreased	teacher changes the task
	teacher proactively provides help
	teacher ignores or inadequately discusses cognitively activating aspects
oCAP unchanged	–
oCAP increased	teacher provides further cognitively activating information
	teacher elicits further cognitively activating information

The subscale “teacher changes the task” refers to a situation where the teacher proactively changes the task in a way to make it easier. Even though one could argue that a teacher may consciously do so for didactic reasons in order to model and explain the learning content (Holtsch & Forster-Heinzer, 2020), this kind of proactive guidance is considered to be detrimental to students’ learning in this study for the following two reasons: First, it has been shown in previous studies that complex tasks are often reduced in their cognitive potential because teachers work through them in small steps and strongly guide the discussion (Klieme et al., 2001, p. 45; Kunter & Voss, 2013, p. 102). Second, prescribing how exactly a task needs to be solved is considered to be a negative indicator of cognitive activation (Praetorius et al., 2018), whereas not reducing the complexity of a task immediately, even if the students are asking for help, is considered to be cognitively activating (Praetorius et al., 2020). An example in the video study where the teacher proac-

tively changed the task and, thereby, reduced its complexity and potential is the following one:

What effects do exchange rate fluctuations have on Switzerland? And based on that background, how do you assess the impact of the appreciation of the Swiss franc since 2007 and the introduction of the minimum euro rate by the Swiss National Bank in September 2011? [task implemented in class 7, translated from German]

According to the oCAP, those questions were considered to have a high level of “openness.” However, in the lesson, the teacher did not give the students time to solve the questions themselves but discussed them immediately in class. Also, she broke the questions down into several smaller questions,⁴ thereby making the task less divergent.

The subscale “teacher proactively provides help” examines whether the teachers in the video study offer help without being asked to by the students. As mentioned above, teachers should not reduce the complexity of a task immediately, even when the students ask for help, but, instead, elicit the students’ thoughts and opinions (Praetorius et al., 2020). Thus, proactively helping students may prove detrimental to students’ learning because it prevents them from thinking of a possible solution themselves.

The subscale “teacher ignores cognitively activating aspects” refers to the situation when tasks contain cognitively activating aspects which are not discussed in class. For example, a task may have a reference to students’ everyday life but the teacher ignores that reference when discussing the task in class. Another situation that this subscale refers to is when the teacher discusses the cognitively activating aspect but on a lower level than implied by the task. One example of the video study is a task implemented in class 3, which included several examples to illustrate different phases of the business cycle, such as “Companies are experiencing a sharp decline in their sales and are therefore laying off a lot of employees” or “Economic output rises markedly and, therefore, companies invest heavily and hire new employees” (task used in class 3, translated from German). During discussion, the teacher only provided the results without taking into account the useful examples to solidify the students’ understanding.

The subscale “teacher provides further information” refers to the situation when teachers add cognitively activating aspects during discussion that were not implied

4 “Why is export so important in Switzerland? Do we have more export than import? [...] Do we have more export than other European countries? What goods do we export?” [translated and paraphrased from German]

by the task. This subscale was added because it mirrors the criteria of oCAP, in which the provision of examples, everyday references, and references to current events are considered to be cognitively activating. Moreover, it became clear in the think-aloud interviews with the E&S learners that the provision of further information such as the kind mentioned above also help them to understand a content more deeply.

The subscale “teacher elicits further information” is similar to the subscale “teacher provides further information” with the difference that, in this case, the teachers do not add further information themselves but elicit it from the students. For example, the teacher and students in class 9 were discussing economic growth and wealth and the teacher asked the students what exactly it means for them personally if there is economic growth in the country that they live in. By asking the students to refer to their personal situation, the teacher increased the cognitive activation potential with regard to the criterion “reference to everyday life.”

Coding of the Objective and Realized Cognitive Activation Potential

The *coding of the objective CAP* of the tasks was conducted by two coders and took place from August 2018 until February 2019. It involved a comprehensive training in August, six trial codings between August and November 2018, and two double codings in December 2018 and February 2019. Each trial coding and double coding was followed by a meeting, in which the two coders discussed differentiating codes, found a consensus, and adapted the manual. The training, trial codings, and consensus discussions were necessary to provide thorough and elaborate descriptions for the criteria and their scale levels as well as to illustrate each scale level with one or several anchor examples (Pauli, 2014). The double coding in December, where a sample of 12% of the total number of tasks was double coded, served to assess the intercoder reliability (Cohen’s Kappa) (Döring & Bortz, 2016, p. 558). After the first double coding, 12 out of 13 criteria achieved an acceptable fit of $K \geq 0.7$. For the criterion with a lower fit, another double coding with 12% of the tasks was conducted in February 2019. After an acceptable fit of $K \geq 0.6$ was reached for this criterion as well, the remaining tasks were coded by only one person. The main coding took place between March and April 2019.

The *coding of the rCAP* of the tasks was conducted by two coders and took place from February until September 2019. It involved a comprehensive training in February, seven trial codings between February and July, and a double coding in July. Each trial coding and double coding was followed by a meeting, in which the two coders discussed differentiating codes, found a consensus, and adapted the man-

ual. This procedure served to provide thorough and apt descriptions for each scale and subscale level and to illustrate them with appropriate anchor examples (Pauli, 2014). The double coding was conducted in July and served to assess the inter-coder reliability (Cohen’s Kappa) (Döring & Bortz, 2016, p. 558). After an acceptable fit ($K \geq 0.6$) was reached for every subscale, the remaining tasks were coded by only one person. The main coding took place between August and September 2019. Illustration 7.3 shows the combination of methods used for the data collection and the data evaluation.

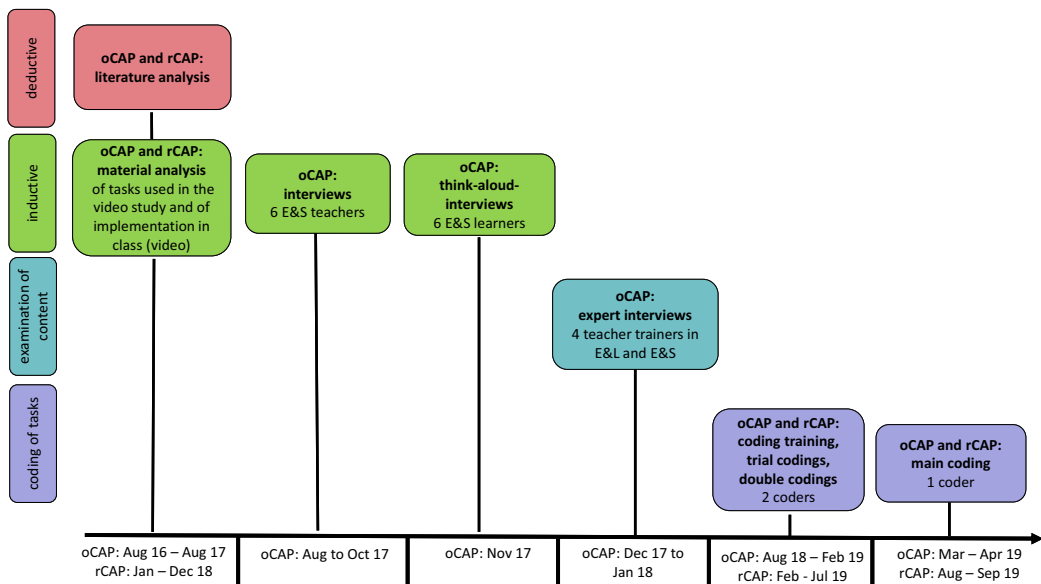


Illustration 7.3. Chronological representation of the methods used.

RESULTS

Objective Cognitive Activation Potential of E&S Tasks

Concerning the first research question how cognitively activating the E&S tasks are at commercial vocational schools in German-speaking Switzerland, it was found that tasks are often on a low to medium level. Illustration 7.4 shows the objective CAP of the tasks for all the nine classes.

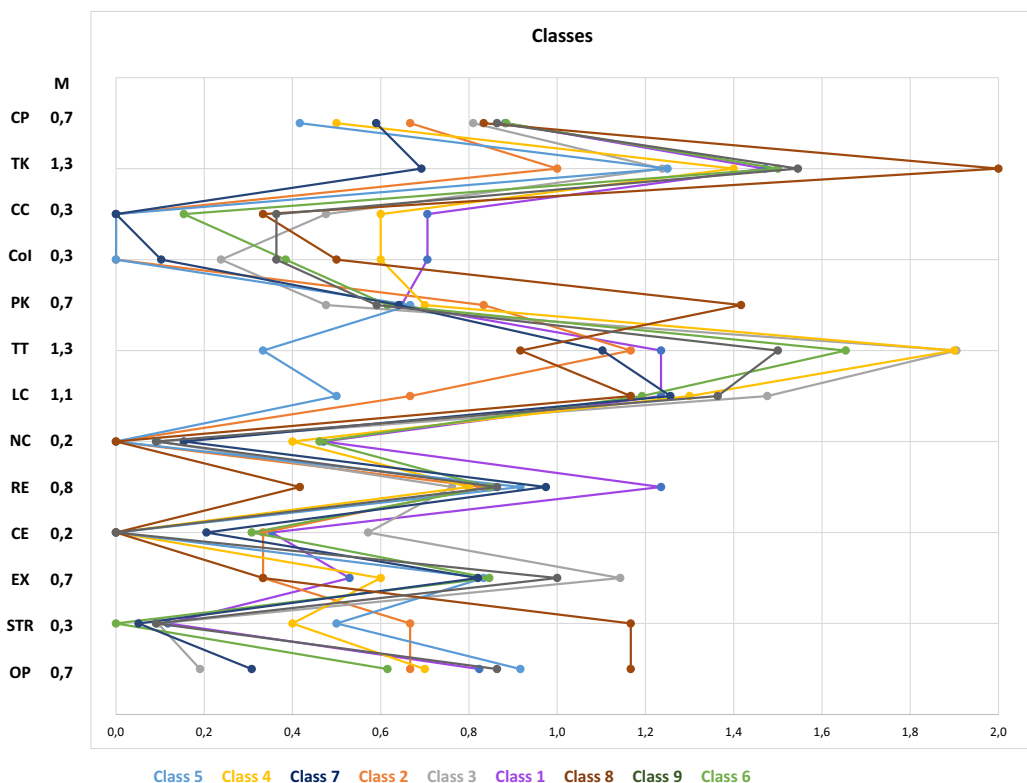


Illustration 7.4. oCAP of the nine classes in the video study.

The lines represent the means (0.0 = low level; 1.0 = medium level; 2.0 = high level) for every class and every criterion over measuring points 1 and 2. The means for the criteria show that most criteria are on a low level (“Cognitive conflict (CC),” “Conflict of interest (CI),” “Numeric complexity (NC),” “Current events (CE),” “Structuring (STR)”) or low-medium level (“Cognitive process (CP),” “Prior knowledge (PK),” “Reference to everyday life (RE),” “Examples (EX),” “Openness (OP)”). Only a few criteria are on a medium level (“Language complexity (LC)”) or medium-high level (“Type of knowledge (TK),” “Technical terms (TT)”). No criterion could be found on a high level. The overall mean is at a low-medium level with a value of 0.7.

Moreover, the illustration shows that the teachers of class 8, class 3, and class 1 use tasks that reveal the highest ranking for the oCAP. The tasks used in class 8 show the highest level of oCAP for the four criteria “Type of knowledge (TK),” “Prior knowledge (PK),” “Structuring (STR),” and “Openness (OP)”. Especially the values for the criteria STR and OP differ strongly from the values of the other

classes as the means for class 8 are at a medium-high level (1.2 for both criteria), whereas the means for the other classes are on a low to low-medium level. The tasks used in class 3 reveal the highest level of oCAP for the four criteria “Language complexity (LC),” “Current events (CE),” “Examples (EX),” and “Technical terms (TT),” while the highest rank for the last criterion (TT) is shared with class 4. Finally, the tasks used in class 1 show the highest level of oCAP for the four criteria “Cognitive conflict (CC),” “Conflict of interest (COI),” “Reference to everyday life (RE),” and “Numeric complexity (NC),” while the highest rank for the last criterion (NC) is shared with class 6.

The teacher of class 5 tends to use tasks that reveal a rather low oCAP. The tasks used in this class receive the lowest ranking for the seven criteria “Cognitive Process (CP),” “Conflict of interest (COI),” “Technical terms (TT),” “Language complexity (LC),” “Cognitive conflict (CC),” “Numeric complexity (NC),” and “Current events (CE),” while the rankings for the last three criteria (CC, NC, and CE) are shared with other classes. The teacher of class 8 also tends to use tasks that partly reveal a low oCAP. More precisely, the tasks used show the lowest ranking for the four criteria “Reference to everyday life (RE),” “Numeric complexity (NC),” “Current events (CE),” and “Examples (EX),” while the rankings for the last three criteria (NC, CE, and EX) are shared with other classes.

In summary, the findings regarding the oCAP show that the CAP of most criteria remains on a low or low-medium level, indicating that despite the much-discussed importance of cognitively activating tasks, teachers do not tend to employ tasks with a high oCAP. Regarding the classes, one class (class 5) reveals a consistently low level of oCAP compared to the other classes, whereas other classes (classes 3 and 1) in comparison show a consistently high level of oCAP. Moreover, class 8 shows both a low and high level of oCAP depending on the criteria.

Realized Cognitive Activation Potential of E&S Tasks

Regarding the analysis of the rCAP, the present study focuses on two different questions, namely the rCAP regarding each criterion and the employed manners in which the teachers change the oCAP through implementation in class.

rCAP Regarding Each Criterion

In the first research question concerning the rCAP, it was examined regarding which cognitively activating criteria the teachers increase or decrease the CAP of a task through implementation in class. Table 7.4 provides the number of the tasks

(in percentage), which are decreased, left unchanged or increased regarding every criterion.

Table 7.4. rCAP of cognitively activating criteria

	CP	CC	CoI	PK	LC	NC	RE	CE	EX	STR	OP	M
1: oCAP decreased	2.1	6.2	11.3	12.4	0	1.0	4.1	1.0	2.1	16.5	5.2	5.6
2: oCAP unchanged	97.9	88.7	83.5	61.9	92.8	97.9	85.6	89.7	78.4	76.3	94.8	86.1
3: oCAP increased	0	5.1	5.2	25.8		1.0	10.3	9.3	19.6			8.1

Comments: M = mean

Table 7.4 demonstrates that the teachers most often implement the tasks as given, meaning without decreasing or increasing their potential. In the cases where the CAP is *decreased*, the results show that, in comparison to the CAP of the other criteria, the CAP of the criterion “Structuring (STR)” is most often decreased in class (16.5%), followed by the criteria “Prior knowledge (PK)” (12.4%) and “Conflict of interest (CoI)” (11.3%). The CAP of the criterion “Language complexity (LC)” is never (0%) and the CAP of the criteria “Cognitive process (CP)” (2.1%), “Current events (CE)” (1.0%), and “Numeric complexity (NC)” (1.0%) are very rarely decreased. With regard to *increasing the oCAP*, the results show that, in comparison to the CAP of the other criteria, the CAP of the criterion “Prior knowledge (PK)” is most often increased (25.8%), followed by the criterion “Examples (EX)” (19.6%). The CAP of the criteria “Reference to everyday life (RE)” (10.3%) and “Current events (CE)” (9.3%) are rather often increased, as well. The CAP of the criterion “Cognitive process (CP)” is never (0%) and the CAP of the criterion “Numeric complexity (NC)” (1.0%) is very rarely increased.

Employed manners to change the objective CAP

In the second research question concerning the realized CAP, it is examined in what way the teachers increase or decrease the oCAP. Table 7.5 demonstrates that tasks are mostly implemented the way they are given (58.19%). Whenever the oCAP is changed, teachers most often do so by providing further information (subscale 2a; M = 7.07%), especially by providing extra examples (19.6%) or further information regarding “Prior knowledge (PK)” (16.5%). Moreover, teachers also quite often tend to elicit information (subscale 2b) regarding the criteria “Prior knowledge (PK)” (9.3%) and “Reference to everyday life (RE)” (8.2%).

Table 7.5. Manners to decrease and increase the objective CAP through implementation

	CP	CC	CoI	PK	LC	NC	RE	CE	EX	STR	OP	M
1a: change task	0										5.2	2.60
1b: provide help	0	0	0	10.3	0	1.0			0	16.5	0	3.09
1c: inadeq. discussion	2.1	6.2	11.3	2.1			4.1	1.0	2.1			4.13
2: unchanged	97.9	88.7	83.5	61.9	92.8	97.9	85.6	89.7	78.4	76.3	94.8	58.19
3a: provide information		1.0	3.1	16.5			2.1	7.2	19.6			7.07
3b: elicit information	0	4.1	2.1	9.3		1.0	8.2	2.1				3.35

Comments: inadeq. discussion = inadequate discussion; m = mean

Teachers least often change the oCAP by changing the tasks (subscale 1a; $M = 2.60\%$) and they only do so regarding the criterion “Openness (OP)” (5.2%). However, the teachers sometimes decrease the oCAP by discussing the tasks in an inadequate way or ignoring cognitively activating aspects (subscale 1c; $M = 4.13\%$), especially with regard to the criterion “Conflict of interest (CoI)” (11.3%). Also, they quite often decrease the objective CAP by providing help (subscale 1b) regarding the criteria “Structuring (STR)” (16.5%) and “Prior knowledge (PK)” (10.3%).

In summary, the findings regarding the rCAP show that the CAP of the criteria remains most often unchanged. There are a few criteria (“Structuring” and “Conflict of interest”), whose CAP tends to be decreased more often and a few criteria (“Examples”, “Reference to everyday life” and “Current events”), whose CAP tends to be increased more often than the CAP of the other criteria. Moreover, there is one criteria (“Prior knowledge”), whose CAP tends to be both decreased and increased quite frequently in comparison to the other criteria. Furthermore, whenever the CAP of a task is changed, the teachers decrease and increase the CAP almost equally often (aggregated mean of 1a, 1b, and 1c = 9.82% and aggregated mean of 3a and 3b = 10.42%).

DISCUSSION

This section is divided into “Summary and interpretation” and “Limitations and implications.”

Summary and Interpretation

This chapter focused on the cognitive activation potential of tasks used at commercial vocational schools. In contrast to previous studies, which mainly focused

on mathematics but also on physics, biology or German, the targeted subject of this study was Economy & Society (E&S). The analysis was based on a video study in 2014 where nine classes from nine different commercial vocational schools in German-speaking Switzerland participated.

The nine classes of the video study showed a low to medium oCAP in general. However, the level of the potential depends on the criteria as some of them (e.g., “Type of knowledge (TK),” “Technical terms (TT),” and “language complexity (LC)”) generally show quite high levels ($1.0 >> 1.5$) while others (e.g., “Cognitive conflict (CC),” “Conflict of interest (CoI),” “Numeric complexity (NC),” “Current events (CE),” and “Structuring (STR)”) generally show very low levels (<0.4). Possible reasons why “Technical terms (TT)” and “Language complexity (LC)” were quite high is because learners of the subject E&S need to know and understand a variety of terms. Moreover, articles and reports are often used in class, which may contribute to the increase in language complexity. A possible reason why “Numeric complexity (NC)” and “Conflict of interest (CoI)” did not show high results is that those two criteria are rather specific for some of the E&S areas such as monetary policy, economic growth, or ecology, whereas in other E&S areas, numbers and conflict of interests hardly appear.

There were also differences among the classes as the teacher of class 5 often used tasks that ranked very low among several criteria, whereas the teachers of class 1 and 3 used tasks that ranked high among several criteria. Moreover, the teacher of class 8 used tasks that rank both high for some criteria and low for other criteria. A possible reason is that the students in that class had to do presentations, in which they were not only asked to link new and old information with prior knowledge but in which they also had to think of a suitable way themselves to present their topic understandably to the other students. Thus, these tasks can be regarded as highly cognitively activating regarding criteria such as openness, structuring or prior knowledge without, however, necessarily revealing a high level of oCAP in other criteria as well.

During the implementation of the tasks in class, the oCAP remained mostly unchanged (86.1%). A possible explanation could be that only situations where the teacher proactively changed the CAP were assessed. Situations where an increase or a decrease in the oCAP was initiated by the students were not counted. This decision takes into account the circumstance that learners need to be adequately challenged in order to be cognitively activated (see section 2).

A decrease in the oCAP through implementation in class mostly involved the criteria “Structuring (STR)” (16.5%), “Prior knowledge (PK)” (12.4%), and “Conflict of interest (CoI)” (11.3%), whereas an increase in the oCAP mostly involved

the criteria “Prior knowledge (PK)” (25.8%), “Examples (EX)” (19.6%), “Reference to everyday life (RE)” (10.3%), and “Current events (CE)” (9.3%). The latter implies that teachers often attempt to consolidate the students’ knowledge by linking it either to topics that were discussed in class before or to relevant topics in the news. Moreover, they may try to make the topic more tangible through providing general examples or discussing situations from everyday life.

Regarding the manners, in which the teachers change the objective CAP, the results show that whenever the oCAP is changed, the teachers most often do so by providing further cognitively activating information (subscale 2a; $M = 7.07\%$) and least often do so by changing the task in a way to make it less cognitively activating (subscale 1a; $M = 2.6\%$). Most often, the potential remains unchanged (58.19%). Whereas it can be noted on a positive side that the objective CAP is not often decreased, it is not often increased in class, either. A possible explanation here is that E&S teachers at commercial vocational schools in German-speaking Switzerland are under time pressure to cover all the relevant topics required for the final exams. Therefore, they might not take the time to provide or elicit further cognitively activating aspects when discussing the tasks.

Limitations and Implications

A few limitations have to be mentioned with regard to the present study. First, even though assessing the cognitive activity of the students would have added another crucial perspective regarding cognitive activation, it was not possible to do so in the present study. The reason why is because this study is based on the preexisting data of the LINCA video study (see section 0), in which the students were not asked to assess their cognitive activity with regard to task experience and performance. However, the present findings may serve as a basis for a potential follow-up study, in which a selection of tasks with specifically high levels (see class 1 or 3), low levels (see class 5), and conflicting levels (see class 8) are re-implemented in another class and the students are subsequently asked to report their cognitive activation with regard to the tasks and the implementation in class. Second, the inductive criteria are based on the statements of a selective sample of 12 interviewees in total. Thus, the sample cannot be regarded as representative since, firstly, it was not chosen randomly and, secondly, its size is rather small due to the qualitative nature of the study. Consequently, the results may have turned out differently if the interviews had been conducted in another sample. Therefore, the inductive criteria found in this study should be reanalyzed in a quantitative follow-up study with a bigger sample.

Despite the limitations, this study also offers several new insights and implications. On the one hand, it provides a first overview of the objective and realized cognitive activation potential of E&S tasks at commercial vocational schools in German-speaking Switzerland. Therefore, it adds new information regarding the cognitive activation potential in a subject, which has not been analyzed yet. This could be regarded as an important contribution to the cognitive activation potential in general, given the content-dependent nature of that dimension. Also, the findings showed that despite the much-discussed importance of cognitive activation, the CAP of the tasks used at commercial vocational schools is quite low. Therefore, the cognitively activating criteria regarding the oCAP may be useful for future teacher trainings where teachers may gain a more profound understanding on how to use teaching material in order to cognitively activate students. This can be especially valuable in cases when teachers create their own tasks or when they intend to modify a given task. Moreover, the cognitively activating criteria regarding the rCAP can also be used in future teacher trainings in order to make teacher aware of potential pitfalls to unintentionally decrease and of possible and useful manners to increase the oCAP through implementation in class. Such a training may prove to be highly beneficial as the present study revealed that the oCAP remains most often unchanged and is rarely increased, despite the low oCAP of the tasks used and implemented. All in all, the findings of this study may be a valuable contribution to increasing the cognitive activation potential of both the tasks used and their implementation in E&S classes.

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