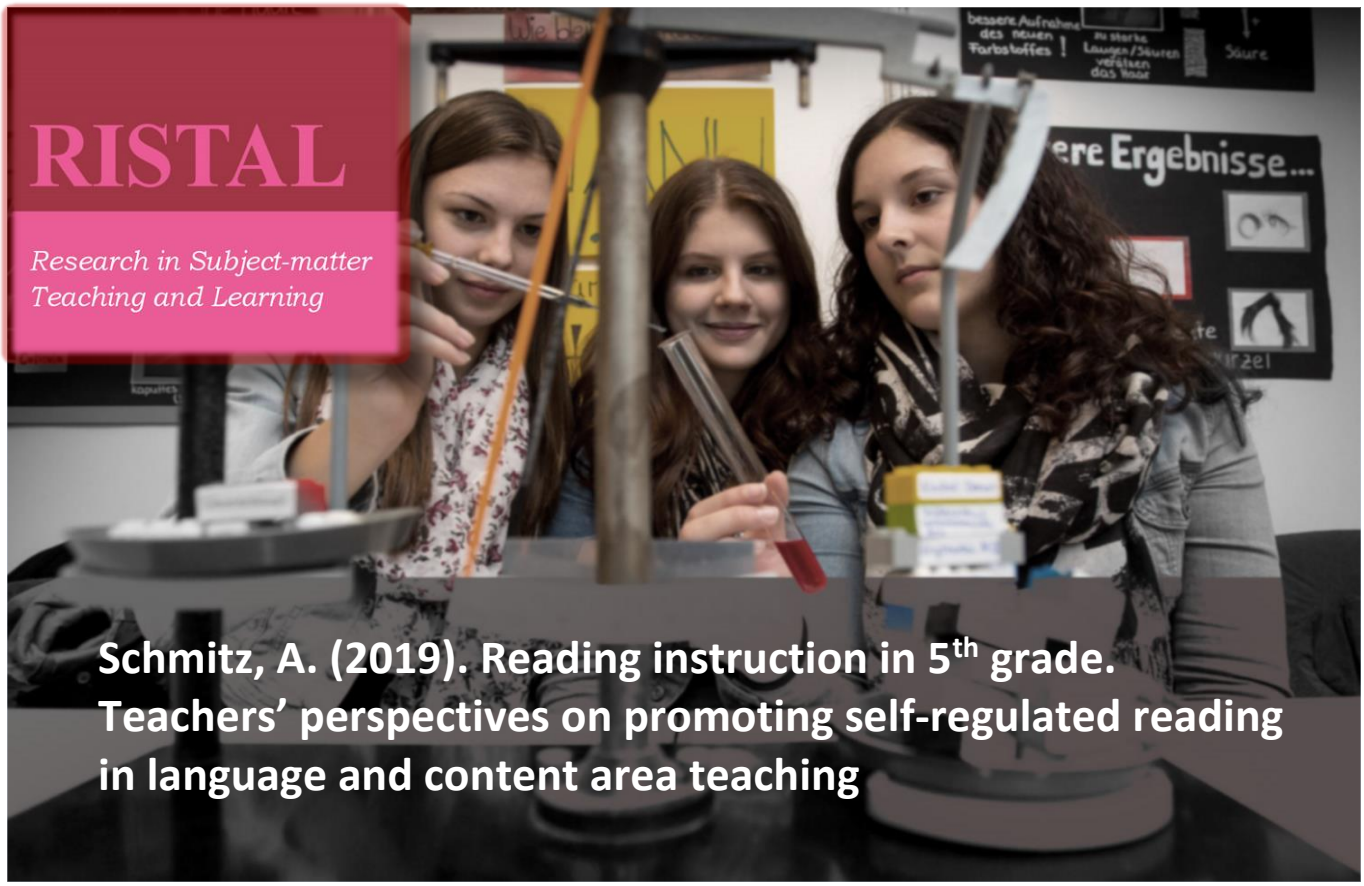

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Reading instruction in 5th grade: teachers' perspectives on promoting self-regulated reading in language and content area teaching

Anke Schmitz

Abstract

Self-regulated reading is an effective approach to foster reading comprehension, but many teachers are insecure about how to support strategic reading in natural classrooms. For a successful implementation of self-regulated reading into language and content area teaching discipline-specific strategy-oriented reading instruction has to be defined. This study analyzes teachers' perspectives (*N* = 231) on the instruction of self-regulated reading in German language teaching, biology, and mathematics classes. The study reveals subject differences (e.g. the frequency of cognitive strategies in class), but also commonalities between subjects (e.g. the instruction of cognitive strategies and the frequency of metacognitive strategies, the activation of resource management strategies). The perspective on teachers' discipline-specific reading instruction sheds light on content-specific as well as also cross-curricular reading instruction routines.

Keywords:

reading strategies, text comprehension, teacher education, reading didactics

1 Strategic reading instruction for promoting text comprehension

Reading comprehension is a key-element for educational success which counts for language learning, but also for learning in content areas (Adams & Pegg, 2012; Becker-Mrotzek, Schramm, Thürmann, & Vollmer, 2013). Unfortunately, students in secondary schools have difficulties with text comprehension (Weis et al., 2015).

In Germany, the Ministries of Education of the federal states established the implementation of language education across the curriculum (KMK, 2013). Current (didactic) research focusing on language education in content areas is diverse (cf. overview in Becker-Mrotzek et al., 2013). Regarding reading comprehension, there is research about text features, such as complexity and special language in biology, physics, and chemistry (e.g. Härtig, Bernholt, Prechtl, & Retelsdorf, 2015; Lindauer, Schmellentin, Beerenwinkel, Hefti, & Furger, 2013). Reading processes of students are analyzed when comprehending text-based tasks in mathematics (e.g. Glade & Prediger, 2017; Schukajlow & Leiss, 2011), there are studies about the usage of special language in biology (Nitz, Nerdel, & Prechtl, 2012) and teacher professionalization in history (Handro & Kilimann, 2019). However, there are few recommendations in terms of the promotion of cross-curricular or discipline-specific reading comprehension (Shanahan, Shanahan, & Misischia, 2011, p. 394). The indeterminacy is represented by rather global conceptions such as speech-sensitivity and language-awareness (Gogolin & Lange, 2010) via speech reflection, systematic and transparent instruction, scaffolding, intensive working with and

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writing of texts (Schmölzer-Eibinger, 2013). These approaches represent guidelines for language education, which lack didactical implications for promoting text comprehension and thus overstrain implementation processes at school (Scherf, 2013).

The construct of self-regulated reading (Boekaerts, 1999; Mandl & Friedrich, 2006; Rosebrock & Nix, 2017) is an interface for psychological and didactic approaches to foster expository reading comprehension in particular (Dignath-van Ewijk & Büttner, 2008). Reading strategies help to guide comprehension processes and build new knowledge from texts (Kintsch, 2009, p. 233). Strategic readers apply techniques purposefully to organize text content, connect information with prior knowledge, self-check their understanding, and regulate their motivation and effort (Bräuer, 2015; Kintsch, 2009). As students usually do not acquire such techniques autonomously teachers' external activation and modelling of strategic reading is necessary (Kintsch, 2009; NRP, 2000, p. 11; Willenberg, 2004).

Despite the vital research in strategic reading instruction and reading strategy trainings self-regulated reading has not yet been transferred into classroom practice (Souvignier & Philipp, 2016). This "research to practice gap" (Kretlow & Helf, 2013, p. 167) is caused by teachers' acceptance of strategy trainings, fidelity, and practicability of the material (Scherf, 2013; Souvignier & Philipp, 2016). A further obstructive condition is that research primarily addressed general study skills for additional, prescribed training sessions instead of focusing on natural classrooms. But as "each discipline possesses specialized genre, vocabulary, traditions of communication, and standards of quality and precision, and each requires specific kinds of reading and writing…" (Shanahan et al., 2011, p. 395) (self-regulated) reading instruction should consider discipline-specific affordances and practices (Cascallar & Boekaerts, 2006; Duffy, 2002, Rosebrock & Nix, 2017, p. 92). Furthermore, as the target group for implementing strategy instruction into classrooms, teachers' preferences and practices were almost neglected (Scherf, 2013, p. 423, 2015; Souvignier & Philipp, 2016).

Duke and Pearson (2002, p. 234) conclude that "without finding better ways of bringing effective comprehension instruction to classrooms, continued research refining particular comprehension instruction techniques will provide little or no real value". The present study examines strategy-oriented instruction from two angles to contribute to the question what characterizes content-specific and cross-curricular ways of reading instruction in natural classrooms. Regarding the discipline of learning curricula, reading instruction in (German) language courses is compared with biology and mathematics. Teachers' self-perceptions of instructional routines are investigated because changes and improvements in reading instruction should consider and use teachers' everyday preferences as an anchor (Dumke & Wolff-Kollmar, 1997; Scherf, 2013, p. 430).

2 Dimensions of self-regulated reading and principles for instruction

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According to the established models of (expository) reading comprehension (Kintsch, 1998; Rosebrock & Nix, 2017) text features, reader characteristics and social, motivational and emotional dimensions interact. Readers constructs three levels of mental representations when reading expository texts: a linguistic level, a representation of meaning and text structure (text base) and a representation that integrates local and global coherence, reader's prior knowledge and sensory imagery, emotions, and actions into a situational model (Kintsch, 1998, 2009). From a pedagogical and didactical viewpoint, it is important to point out that especially higher order processes of comprehension require active processing (Rosebrock & Nix, 2017, p. 73) which "can be improved by teaching students to use specific cognitive strategies or to reason strategically when they encounter barriers to comprehension when reading" (NRP, 2000, p. 39).

2.1 Facets of self-regulated reading

Strategic readers "reinforce self-efficacy based on both ability and effort. […] [They] feel confident that they can monitor and improve their own reading so they have both knowledge and motivation to succeed" (Afflerbach, Pearson, & Paris, 2008, p. 370). Transferring self-regulated learning (Boekaerts, 1999) to the domain of reading comprehension we distinguish cognitive, metacognitive and resource management strategies. The core of self-regulated reading is the "ability to select, combine, and coordinate cognitive strategies" (p. 447). These contribute to information processing (ibid.). Weinstein and Mayer (1986) differentiate cognitive strategies of organization, elaboration and memorization (examples in Rosebrock & Nix, 2017, pp. 81-82). Organizational strategies refer to techniques for structuring, relating or grouping text information (e.g. summarizing or visualizing) (ibid.; Pressley, 2002). Strategies of elaboration connect information given in the text with prior knowledge, individual experiences or other reading material (e.g. generating hypotheses about the content, asking questions, activation of prior-knowledge). Memorization strategies function as rehearsals of information (e.g. repeating information, learning by heart) (ibid.). A further dimension of self-regulated reading is the ability to control comprehension with metacognitive strategies (Rosebrock & Nix, 2017, p. 75). Metacognition is a relevant dimension for transferring a cognitive technique (e.g. underlining) to a purposeful strategy (Bräuer, 2015). The latter includes goal-setting, selecting appropriate cognitive strategies, monitoring, and evaluating the comprehension process as well as the application of cognitive strategies (Zimmerman, 2002). Research usually addressed cognitive and metacognitive processes for developing strategy trainings or reading programs (Boekaerts, 1999). However, motivational and affective aspects also guide readers' activities (Guthrie & Wigfield, 2000; Rosebrock & Nix, 2017; Souvignier & Mokhlesgerami, 2006) defined as resource management strategies (Boekaerts, 1999). These strategies steer readers' involvement into reading a text driven by reading motivation, enthusiasm and topic interest, effort and self-efficacy, attention focusing, and time management (Pressley et al., 1998; Zimmerman, 2002).

According to Souvignier and Mokhlesgerami (2006) the construct of self-regulated reading "provides a useful framework for designing a reading environment" (p. 60). The instruction of reading strategies is a chance, but also challenge for teachers to give up responsibility (Rosebrock & Nix, 2017, p. 88) and to "break through students' passivity and involve them in their own learning" (NRP, 2000, p. 40). As students usually do not

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spontaneously use strategies when they had not been explicitly taught (Dole, Nokes, & Drits, 2009), teachers' instruction and modelling is relevant (Hamman, Berthelot, Saia, & Crowley, 2000; Moely, Hart, Leal, Santulli, Rao, Johnson, & Hamilton, 1992; Pressley, 2002, p. 306; Willenberg, 2004).

2.2 Instructional principles for strategy-oriented reading instruction

Duke and Pearson (2002), Kintsch (2009), and Rosebrock and Nix (2017) suggest that teachers should provide students with plenty of opportunities to practice, apply and reflect about reading strategies, ideally starting at primary school (Pressley, 2002, p. 291). Intervention studies strongly support the notion that strategy-oriented reading instruction is most effective when cognitive and metacognitive strategies are taught in combination. Trainings covering either cognitive or metacognitive strategies were less effective (Schünemann, Spörer, & Brunstein, 2013; Seuring & Spörer, 2010). Moreover, Souvignier and Mokhlesgerami (2006) show that a strategy program that includes cognitive, metacognitive strategies and also resource management strategies (motivationally beneficial attributions) has the strongest effect on comprehension, strategy knowledge and the application of reading strategies in fifth grade students.

Other studies concentrated on principles of strategy-oriented instruction for weaker students and derived instructional principles (Duke & Pearson, 2002, p. 208). Duffy (2002, p. 30) argues that (1) a direct explanation of strategies is an appropriate means to enable weaker readers to control their own comprehension. Direct explanation is characterized by an explicit description which strategy is necessary for understanding (declarative knowledge), when the strategy is appropriate for understanding the text (conditional knowledge) and, how to perform the strategy (procedural knowledge) (Rosebrock & Nix, 2017, p. 85). (2) Additionally, the teacher should explain his own thinking and actions during strategy use by mental modeling (see also thinking aloud: Willenberg 2004). (3) A collaborative use of the strategy in action must include the responding to students' restructuring of their understanding about the strategy. (4) Scaffolded practice should follow where students practice the strategy with a gradual release from the teacher's coaching. (5) Finally, students should be given time to independently practice and apply the strategy individually (Duke & Pearson, 2002, p. 208-209; Rosebrock & Nix, 2017, p. 87). These principles which are said to be relevant for language arts and content area classroom (Spence, Yore, & Williams, 1999) emphasize the "crucial role of the teacher" (Duffy, 2002, p. 34).

Whilst the former principles appeal foremost to cognitive and metacognitive strategies, teachers should also activate students' resource management strategies, otherwise the afore-mentioned principles will not flourish (Dole et al., 2009; Duke & Pearson, 2002, p. 207). Students "must be active, and instruction must provide reason for the active effort, which can be done by engaging students' interest and motivation" (Kintsch, 2009, p. 229). In this context it is important for teachers to motivate and involve students (NRP, 2000, p. 40), for instance by discussing texts, collaborative text work, considering students' interests, asking for own opinions, and emphasizing that reading is enjoyable (Pressley et al., 1998; Rosebrock & Nix, 2017). Teachers should also promote students'

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effort and self-efficacy by creating a supportive learning environment with positive reinforcement, confirming students' belief that they are able to handle difficult texts, helping where difficulties arise, and giving hints for individual improvement (Dole et al., 2009).

However, there is still need for a discipline-specific strategy-oriented reading instruction (Adams & Pegg, 2012; Cascallar & Boekaerts, 2006; Scherf, 2013) which provides students with opportunities to acquire expert-like strategies for comprehending specialized texts (Kintsch, 2009, p. 231).

3 Empirical insights into practices of (self-regulated) reading instruction

Research on reading strategies that are content specific is still in its infancy (Dole et al., 2009, p. 36; Spence et al., 1999). The following qualitative observational and interview studies as well as teacher surveys provide insight into strategy-oriented reading instruction in natural classrooms.

Ness (2008, 2016) observed 40 hours of science and social studies classroom practices of 8 middle and high school teachers in the US. Reading comprehension instruction focusing on cognitive and metacognitive strategies comprised only 3% of classroom observations. Most often teachers asked their students to summarize content and to answer questions. Moely and colleagues (1992) also reveal an infrequent reading strategy instruction from kindergarten to sixth grade (*N* = 69 teachers, 172.5 hours). In 9.5% of the observed lessons the teachers offered descriptions of cognitive processes students should use. Specific cognitive strategies were suggested in less than 3% of the lessons and their function was explained in less than 1%. A comparison of mixed classrooms (language and mathematics taught in combination) with language classrooms shows that more (specific) strategies were taught in mixed classrooms than in exclusively language arts classrooms. Anmarkrud and Bråten (2012) observed reading instruction routines (16 hours) of four teachers in lower-secondary schools in Norwegian language arts classrooms. About 20% of the instructional time reading strategies were taught, thereof 15% elaboration strategies and about 2% organizational, memorization, and metacognitive strategies. Regarding the explicitness of instruction, 6% of the instructional time organizational and rehearsal strategies were instructed explicitly, whereas elaborative and metacognitive strategies were instructed implicitly. The same counts for Pressley and colleagues (1998) study on reading instruction (*N* = 10 teachers) in fourth and fifth grade language art classes. The teachers asked their students to apply reading strategies without explaining the processing and purpose of strategies. Hamman et al. (2000) complete the picture of scarce and implicit instructional routines. They observed the frequency and type of learning strategy instruction of middle school teachers (*N* = 11 teachers, 16.5 observed hours) in grades 6 and 7 (mathematics/science versus English/social studies classes) in North America. In contrast to the other studies, they not only focused on cognitive and metacognitive strategies, but also on time management and attention regulation. 9% of the observed instructional time referred to elaboration and metacognitive strategies. Memorization strategies, and also attention as well as time management,

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were covered at least by the teachers. Differences between the subjects were not existent. Kistner, Rakoczy, Otto, Klieme, and Büttner (2015) conclude from their observational study with Swiss mathematics teachers (*N* = 20) that the amount of explicit strategy teaching was rather low. Kleinbub (2010) analyzed reading instruction in German language arts classrooms in fourth grade (*N* = 41 classes). The study also confirms the above-mentioned findings that strategy-oriented instruction plays a minor role in language teaching. Cognitive strategies were instructed rarely, and metacognitive strategies were not observable at all. Similar results became evident in a study with language teachers' journals regarding 5th grade reading instruction (Schmitz & Jost, 2019). Scherf (2013, 2015) offers a deeper insight into language teachers' conceptions and orientations towards reading instruction in secondary schools (*N* = 21). Group discussions and narrative interviews show that teachers highlight specific aspects of fostering reading comprehension deriving from instructional experiences, foremost addressing motivational aspects of instruction (reading time and variety of reading material), but also applying thinking aloud, paired-reading and sometimes self-regulated reading.

These qualitative findings can be verified by teacher surveys. Lankes and Carstensen (2008) questioned 418 language teachers in Germany about the instruction and application of reading strategies in grade 4. Teachers state that they let their students practice reading strategies less than once a week and that there is not sufficient time for self-regulated reading. Dumke and Wolff-Kollmar (1997) examined instructional routines of 75 secondary school teachers in Germany regarding the frequency of instructing cognitive reading strategies. Teachers most often ask their students to reread texts, make notes, underline important words, create summaries, generate headlines, and answer questions formulated by the teacher. They let them also often to compare the texts' content with prior knowledge. To visualize content and to ask questions by themselves was expected rarely. Seldomly, the generation of inferences and the formulation of hypotheses about the text were realized according to the survey.

Conclusively, (explicit) strategy-oriented reading instruction in natural classrooms seems to be lacking and worthy of improvement in terms of language teaching classes and content areas (NRP, 2000; Pressley, 2002). Unfortunately, the studies can hardly be compared and give only little insight into discipline-specific instructional routines concerning the facets of self-regulated reading. It remains unclear which specific cognitive and metacognitive strategies are applied in different subjects and the activation of resource management strategies by teachers is underexposed in empirical research.

4 Research questions

The present study addresses teachers' strategy-oriented reading instruction in German language courses compared to biology and mathematics. The ways in which teachers promote self-regulated reading instruction in 5th grade when comprehending expository texts or text tasks is analyzed, and which commonalities and differences exist between subjects. Three research questions are formulated:

1. How often do the teachers ask their students to apply cognitive strategies, which strategies do they prefer and how do they instruct cognitive reading strategies?

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2. How often do the teachers instruct specific metacognitive strategies and which strategies do they select?
3. To which extent do they activate resource management strategies in class?

5 Method

5.1 Participants

The study was conducted in the context of an evaluation study which analyzes the implementation of concepts improving reading competencies in secondary schools, especially focusing on self-regulated reading. During the evaluation-process, the competencies of students are assessed from grades 5 to 6, teachers' reading instructions in class are observed and the teachers are questioned about their strategy-based reading instruction, which is the focus of this article. In the present study 231 5th grade teachers of 23 secondary schools in Germany participated, thereof 135 German language teachers, 37 biology teachers and 60 mathematics teachers. They were *M* = 42.00 years old (*SD* = 10.71) with an average working experience of *M* = 14.50 years (*SD* = 10.32). 178 participants were female and 54 were male.

5.2 Design

The survey covered three categories orienting at Boekaerts (1999) model of self-regulation: (1) cognitive reading strategies (frequency; type of organizational, elaborative and memorization strategies; way of instruction); (2) metacognitive reading strategies (frequency; type of metacognitive strategies); (3) resource management strategies (motivation and involvement for reading; supportive reading climate). The means of these categories represented the dependent variables. The independent variable was the school subject (German language courses; biology classes; mathematics classes).

5.3 Operationalization of strategy-based reading instruction in the questionnaire

Regarding cognitive strategies, organizational, elaborative and memorization strategies were distinguished (Rosebrock & Nix, 2017; Weinstein & Mayer, 1986). Strategies were selected that are said to be relevant for language courses, but also strategies investigated in mathematics and biology, such as underlining keywords, summarizing, and visualizing text content (Lindauer et al., 2013; Schukajlow & Leiss, 2011). The teachers were asked how often they usually let their students apply specific strategies when trying to comprehend an expository text or working on a text-based task (the comprehension of literary texts was neglected to limit the objective). Additionally, they were questioned as to how explicitly they usually instruct a new cognitive strategy referring to the instructional principles by Duke and Pearson (2002). The frequency and type of strategies were also addressed in terms of the metacognitive dimension regarding planning, monitoring and reflecting about the comprehension process and strategy use (Zimmerman, 2002). Regarding resource management strategies, the teachers were questioned about their way of involving and motivating students for reading and if they are supporting their

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students (DESI, 2009; PISA, 2006). Table 1 illustrates the categories of self-regulation, the items, reliability of the scales, and examples questions.

Tab. 1: Categories of self-regulation in teachers' questionnaire.

Category		Items	Reliability (Cronbach's α)	Examples	Source
Cognitive strategies	Frequency of cognitive strategies	12	.81	*How often shall your students apply the following strategies?* *underlining, visualization* *create own examples, activate prior knowledge* *reread passages, copy text*	*Weinstein & Mayer (1986); Mandl & Friedrich (2006)*
	Instruction of cognitive strategies	5	.80	*How far do you agree with the following statements?* *Explain that technique is a strategy (declarative)* *Explain the function of the strategy (conditional)* *Model how the strategy has to be applied (procedural)*	*Duke & Pearson (2002)*
Metacognitive strategies	Frequency of metacognitive strategies	7	.80	*How often shall your students apply the following strategies?* *Select strategies before reading* *Observe reading during comprehension* *Reflect about comprehension after reading*	*Boekaerts (1999); Zimmerman (2002)*
Resource management strategies	Involvement and motivation for reading	4	.79	*How far do you agree with the following statements?* *I encourage my students to discuss about texts.* *I convince my students that reading is fun.*	*PISA (2006); DESI (2009)*
	Supportive reading climate	4	.78	*How far do you agree with the following statements?* *I confirm my students to read even a difficult text.* *I encourage my students to move on when reading a difficult text (task).*	*PISA (2006); DESI (2009)*

Note. Four-tier Likert scale (1 = I disagree; 2 = I rather disagree; 3 = I somewhat agree; 4 = I fully agree) or (1 = in hardly any lesson; 2 = in some lessons; 3 = in many lessons; 4 = in almost every lesson).

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6 Results

Analyses of variance were calculated with the subject (German language teaching, mathematics, biology) as an independent variable and the means of the above-mentioned categories of self-regulation as dependent variables. If Levene's-Tests were significant, because of the different group sizes, Welch-Tests were used to decide if the groups statistically differed. For post-hoc comparisons of the means Scheffé-Tests were applied.

6.1 Frequency, preference and instruction of cognitive reading strategies

Teachers' subject has a significant effect on the frequency as well as the instruction of cognitive strategies in class (table 2).

Tab. 2: Analysis of variance for cognitive strategies.

Category		Subject	*M (SD)*	*F*	*p*	partial η^2
Cognitive strategies	Frequency	German Mathematics Biology	2.53 (0.37) 2.36 (0.48) 1.95 (0.41)	29.01	.000	.20
	Instruction of cognitive strategies	German Mathematics Biology	3.28 (0.49) 3.17 (0.65) 2.59 (0.77)	17.95	.000	.14

Note. Four-tier Likert scale (*1 = I disagree; 2 = I rather disagree; 3 = I somewhat agree; 4 = I fully agree*) and *(1 = in hardly any lesson; 2 = in some lessons; 3 = in many lessons; 4 = in almost every lesson).*

Regarding the frequency of cognitive strategies, differences (p <. 001) between all subjects were found to exist. German language teachers apply cognitive strategies more frequently (in many lesson) than mathematics teachers (in some to many lessons) and biology teachers (in many lessons). The instruction of cognitive strategies seems to not differ between German language and mathematics teachers (both somewhat agree), but both groups differ from biology teachers (p < .001) who rather disagree to somewhat agree. Tables 3 and 4 illustrate the means and standard deviations for particular strategies.

Tab. 3: Frequency of particular cognitive strategies.

	Frequency of cognitive strategies	German *M (SD)*	Mathematics *M (SD)*	Biology *M (SD)*
Organizational strategies	Underlining keywords	3.04 (0.70)***	*2.31 (0.89)*	*2.33 (0.82)*
	Summarizing text or paragraphs	*2.80 (0.69)*	*2.56 (0.79)*	2.27 (0.78)***
	Visualizing	1.92 (0.55)**	*2.22 (0.80)*	*2.16 (0.71)*
	Scanning the text	2.54 (0.80)***	*2.08 (0.85)*	*1.86 (0.85)*
	Structuring the text	2.78 (0.94)***	2.45 (1.09)***	1.72 (0.76)***

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Elaborative strategies	Taking notes	2.71 (0.67)***	*2.25 (0.97)*	*2.35 (0.73)*
	Formulating hypotheses when reading the headline	*3.04 (0.77)*	*2.87 (0.95)*	1.78 (0.80)***
	Formulating hypotheses when reading discontinuous text segments	*2.66 (0.78)*	*2.82 (0.83)*	2.21 (0.83)***
	Generating own examples	*2.45 (0.78)*	*2.68 (0.87)*	2.18 (0.82)**
	Formulating own questions	*2.36 (0.60)*	*2.10 (0.84)*	1.72 (0.57)***
Memorization strategies	Repeated reading	*2.99 (0.81)*	*3.04 (0.82)*	2.14 (0.84)***
	Copying the text or text segments	*1.33 (0.74)*	*1.40 (0.72)*	*1.33 (0.80)*

Note. Values in italics represent that the values do not differ significantly from each other. * = $p < .05$, ** $p <. 01$, *** $p < .001$. In the mathematics survey text was related to text-based tasks.

A similarity perception between subjects is that the copying of text or text segments is less established while text structuring differentiates all groups. There are many similarities between German language and mathematics teachers (e.g. summarizing the text, generating own examples, students formulating questions, repeated reading), but also commonalities between mathematics and biology teachers (e.g. visualizing text content more often than in German courses). German teachers most often let their students underline keywords and formulate hypotheses about the headline of the text. Mathematics teachers also let their students formulate hypotheses about a headline and practice repeated reading. In biology, teachers most often ask their students to underline keywords and summarize the text or text segments.

Tab. 4: Instruction of cognitive strategies.

Instruction of cognitive strategies	German *M (SD)*	Mathematics *M (SD)*	Biology *M (SD)*
Explain that the technique is a strategy (declarative)	3.42 (0.65)***	*3.11 (0.76)*	*2.90 (0.94)*
Explain the function (conditional)	*3.24 (0.67)*	*3.05 (0.81)*	2.67 (0.93)***
Model the strategy use (procedural)	*3.33 (0.79)*	*3.25 (0.84)*	2.58 (0.85)***
Collaborative training of strategy use	3.60 (0.54)***	3.31 (0.73) ***	2.59 (0.99)***
Independent application of strategy	*2.85 (0.98)*	*3.02 (0.88)*	2.23 (1.06)***

Note. Values in italics represent that the values do not differ significantly from each other. * = $p < .05$, ** $p <. 01$, *** $p < .001$.

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For the instruction of cognitive strategies, many commonalities between German and mathematics teachers get evident, especially regarding the conditional and procedural knowledge and independent application. Biology teachers rather disagree to somewhat agree to explain the function of a strategy, model a strategy, or let students apply a strategy independently. A central difference between the three groups is the collaborative training of the strategy use.

6.2 Frequency and preference of metacognitive reading strategies

The subject has a significant effect on the frequency of metacognitive strategies in class (table 5).

Tab. 5: Analysis of variance for metacognitive strategies.

Category		Subject	*M (SD)*	*F*	*p*	partial η^2
Metacognitive strategies	Frequency of strategies	German	2.50 (0.55)	18.46	.000	.14
		Mathematics	2.17 (0.57)			
		Biology	1.94 (0.50)			

Note. Four-tier Likert scale (1 = in hardly any lesson; 2 = in some lessons; 3 = in many lessons; 4 = in almost every lesson).

German teachers' perceptions differed ($p < .001$) from subject area teachers regarding the frequency and type of metacognitive strategies (no group differences between mathematics and biology). German teachers instruct these strategies in some to many lessons, while mathematics and biology teachers instruct them in some lessons. Table 6 illustrates the means and standard deviations for particular metacognitive strategies.

Tab. 6: Frequency of particular metacognitive strategies.

Type and frequency of metacognitive strategies	German *M (SD)*	Mathematics *M (SD)*	Biology *M (SD)*
Setting a reading-goal before reading	2.43 (0.92)***	*1.96 (0.82)*	*1.87 (1.00)*
Selecting appropriate strategies before reading	1.94 (0.84)***	*1.54 (0.71)*	*1.18 (0.46)*
Monitoring text comprehension during reading	*2.72 (0.82)*	*2.77 (0.86)*	*2.52 (0.96)*
Monitoring strategy use during reading	2.31 (0.84)***	*1.94 (0.92)*	*1.72 (0.74)*
Evaluating text comprehension after reading	*3.42 (0.56)*	*3.22 (0.86)*	*2.93 (0.96)*
Evaluating strategy use after reading	2.20 (0.82) ***	*1.73 (0.85)*	*1.57 (0.71)*
Reflecting about reading success and consequences for the future	2.46 (0.91) ***	*1.90 (0.93)*	*1.59 (0.61)*

Note. Values in italics represent that the values do not differ significantly from each other. * = $p < .05$, ** $p <. 01$, *** $p < .001$.

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The instruction of mathematics and biology teachers is similar regarding the reading goal, the selection of strategies, the monitoring of strategy use and the reflection about reading success and consequences. Both groups differ significantly from German teachers. A commonality between the subjects is that they monitor and evaluate reading comprehension to the same extent.

6.3 Activation of resource management strategies

Table 7 illustrates means and standard deviations for each subject, *F*-values, *p*-values and effect-sizes of the ANOVA for resource management strategies.

Table 7: Analysis of variance for resource management strategies.

Category		Subject	*M (SD)*	*F*	*p*	partial η^2
Resource management strategies	Involvement and motivation for reading	German Mathematics Biology	2.98 (0.45) 2.60 (0.39) 2.44 (0.50)	29.13	.000	.20
	Supportive reading climate	German Mathematics Biology	3.42 (0.36) 3.18 (0.37) 3.13 (0.51)	9.11	.000	.07

Note. Four-tier Likert scale (1 = I disagree; 2 = I rather disagree; 3 = I somewhat agree; 4 = I fully agree).

German teachers' activation of resource management strategies significantly differs from subject area teachers regarding the involvement and motivation for reading ($p < .001$). German language teachers somewhat agree that they involve and motivate for reading, while in the other two subjects the agreement is lower. The post-hoc analysis of the supportive reading climate, which is higher in general than the involvement and motivation for reading, shows that German teachers' answers also significantly differ from mathematics and biology teachers ($p < .001$).

7 Discussion

The study shows commonalities and differences in language and content area teachers' self-perceptions of promoting self-regulated reading. Since these findings are descriptive and teachers' self-perceptions must not correspond to their practice (Hamman et al., 2000; Scherf, 2013) nor to the practices of others (Kistner et al., 2015; Pressley et al., 1998), implications for teaching and learning have to be formulated cautiously.

Overall, the core of self-regulated reading appears to be most content-specific regarding frequency and selection of cognitive strategies and may serve as a starting point for rethinking and developing content-specific reading instruction. It becomes evident that biology teachers should place more emphasis on elaborative strategies, e.g. generating own examples or formulating own questions, to improve learning new concepts from texts. Also, language teachers could practice elaboration strategies more frequently compared to organizational strategies. But for designing content-specific instruction purposefully, the objective and usefulness of strategies (also regarding the reading material) have to be considered. Repeated reading for instance seems to be practiced in

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German and mathematics, but the didactic intentions are certainly different. Language teachers usually let their students read aloud to practice fluency and intonation (Scherf, 2013) whereas mathematics teachers apply re-reading to grasp relevant information in text-based tasks (Leiss & Schukajlow, 2011). In contrast, German language teacher less often apply techniques of visualization than in mathematics and biology, but if visualizations are expedient depends on the texts' content, affordances and structure. For biology teachers, the explicitness of instruction seems to be a field of development, but also for language and mathematics teachers when it comes to reciprocal interactions. Regarding the other two facets of self-regulated reading, metacognition and resource management, the agreements and frequencies are higher in language teachers' perceptions and also more similarities between mathematics and biology become evident. Although metacognition is addressed in language teaching, the strategic dimension should be improved while content area teachers should place more emphasis on activating metacognitive processes for promoting comprehension.

Generally, the survey reveals that self-regulated reading is of more relevance for language teachers than content area teachers which corresponds to the genuine responsibility of language teachers working with texts and practicing strategies (KMK, 2003). As the research objective were expository texts in this study, the practices in German language teaching should be more diverse when the literary comprehension, an important part of language teaching, is included (Rosebrock & Nix, 2017, p. 146ff.). However, the high self-perceptions of language teachers contradict findings from Anmarkrud and Bråten (2012), Kleinbub (2010), and Moely et al. (1992) who identified marginal cognitive strategy instruction in classrooms. The overall lower frequencies and agreements of biology teachers can be compared with Ness (2008, 2016) and maybe caused by internal beliefs that strategy-based reading is acquired in primary schools, not necessary for learning in, ineffective, and time consuming (Adams & Pegg, 2012). Deshler and colleagues (2001) identified that content area teachers depict self-regulated reading instruction as a detraction from content acquisition. In the present study mathematics teachers perceived to incorporate self-regulated reading more frequently in their classrooms than biology teachers. This may be attributed to the complexity and density of text-based tasks and the high amount of language-based research projects in the domain of mathematics which may have affected teacher education and teaching practices.

For further explanations teachers' implicit and explicit knowledge and core beliefs about strategy-based reading instruction and the relation of their perceptions to instructional practices should be included (Pressley et al., 1998; Scherf, 2013). Kistner et al. (2015) reveal that teachers' constructivist beliefs about students' learning are positively associated with the degree of facilitating self-regulation in mathematics. Additionally, the present findings should be verified with further insights, e.g. classroom observations, students' perceptions, and teacher interviews. One source of teachers' core beliefs are their professional experiences (Ness, 2016). These can be actively affected at university, but also during teacher preparation when making first experiences with teaching practices as well as during in-service training (Handro & Kilimann, 2019). The conjunction

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between research on self-regulated reading and school practice should be strengthened, which is not only profitable for teacher professionalization, but also for adjusting research implications to the routines of school practice.

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Anke Schmitz

researcher at the University of Cologne, Faculty of German Language and Literature II.

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