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Self-regulated learning and Latin translation achievement

Effectiveness of different intervention approaches to foster self-regulated learning and Latin translation competency and the examination of cross-lagged relations

Dissertation

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Preface

This doctoral thesis is based on three studies, of which Study 1 is published in the journal *International Scholarly Research Network*[1], Study 2 is submitted to the international journal *Education Research International*[2], and Study 3 to the international journal *Psychology Learning & Teaching*[2].

I am the first author of all three articles, whereby Prof. Dr. Franziska Perels contributed to the studies and writings of all manuscripts. Study 2 additionally involved Sandra Dörrenbächer as a further author.

Consequently, I consistently make use of the plural form "we" instead of "I" when I refer to our proceedings. You will find a summary of all references including those of the single articles at the end of the thesis.

[1] Wagner, D. & Perels, F. (2012). Evaluation of an Intervention Program to Foster Self-Regulated Learning and Academic Achievement in Latin Instruction. *ISRN Education, vol. 2012 (Article ID 848562, doi:10.5402/2012/848562).*

[2] Because of the peer-review process there might be some deviations from the original manuscript in the published versions.

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Index of abbreviations

ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
BFLPE	Big-fish-little-pond-effect
CFA	Confirmatory factor analysis
CFI	Comparative Fit Index
ComG	Combined group
ComT	Combined training
d	Effect size
df	Degrees of freedom
DT	Direct training
DV	Direct variable
e	Error terms
EFA	Exploratory factor analysis
IT	Indirect training
LIST	Inventory for Recording Learning Strategies in Academic Studies
LMS	Learning management system
LTA	Latin translation achievement
M	Mean
MANCOVA	Multivariate analysis of covariance
MLR	Maximum likelihood estimation with robust standard errors
Moodle	Modular Object-Oriented Dynamic Learning Environment
MSLQ	Motivated Strategies for Learning Questionnaire
N	Sample size
p	Probability
RMSEA	Root Mean Square Error of Approximation
r_{tt}	Retest-Reliability
SRMR	Standardized Root Mean Residual
SD	Standard deviation
sDT	Single direct training
SE	Standard error
SEM	Structural equation modelling
sIT	Single indirect training
SRL	Self-regulated learning
T1	Time 1
T2	Time 2
TG	Translation group
α	Internal consistency
$\eta^2_{partial}$	Effect size
κ	Interrater-Reliability
ρ_{cc}	Correlation coefficient
$\chi 2$	Goodness of fit index

General abstract

Providing students with self-regulated learning (SRL) skills is essential for establishing competencies that are necessary for managing the requirements of our fast-paced world. Learning must therefore be regarded as far more than what is taught within the traditional classroom, but should be understood as a lifelong process in which the development of skills and strategies is indispensable (Zimmerman, 2001). The conscious adoption of these abilities should start in early childhood and spread across one's lifespan. Self-regulatory abilities can be applied in all areas of life, whether at preschool, secondary school, or in the workplace, in order to cope with the manifold demands of today's society. In terms of the academic setting, the present thesis focuses on students of Latin because during their course instruction they face diverse and complex learning situations, especially when confronted with the translation of original Latin texts (Doepner, 2008). For the management and structuring of the translation process, students need to apply self-regulatory strategies, which usefully supplement the application of domain-specific strategies (cf. Perels, Gürtler, & Schmitz, 2005).

The present thesis consists of three studies that are all based on an adapted version of the framework of self-regulation by Pintrich (2000). In that version, the different phases of SRL (planning, monitoring, control, reflection) are juxtaposed with the phases of the translation process in Latin (decoding, recoding, restructuring; cf. Glücklich, 2008; Kuhlmann, 2009), in order to model the transferability of SRL strategies to the mastering of the translation process.

The aim of Study 1 and 2 was to test whether students' SRL and translation competency can be promoted by means of different intervention programs. The general findings showed that the interventions were effective in terms of the enhancement of SRL and translation skills.

Study 3 tested the underlying structure of the theoretical framework of SRL and translation that arose from this thesis by hypothesizing bidirectional influences among the

variables of interest. Thereby, I analyzed the predictive value of SRL on Latin translation achievement and vice versa by means of a cross-lagged panel design.

When viewed as a whole, the presented studies highlight the importance of SRL for students' learning process as well as for the appropriateness of their strategy application. Consequently, this thesis has contributed to both research and practice by successfully implementing different intervention approaches in a largely uninvestigated domain.

Zusammenfassung auf Deutsch [General Abstract in German]

Die Vermittlung von Fähigkeiten selbstregulierten Lernens (SRL) ist für den Erwerb von Kompetenzen, die in der mittlerweile sehr schnelllebigen Welt notwendig geworden sind, gerade für Schüler von wesentlicher Bedeutung. Lernen muss daher über das, was im traditionellen Klassenzimmer gelehrt wird, hinausgehen und als lebenslanger Prozess angesehen werden, im Verlauf dessen die Entwicklung von Fähigkeiten und Strategien als unabdingbar zu verstehen ist (Zimmerman, 2001). Die bewusste Aneignung dieser Fähigkeiten sollte bereits in früher Kindheit beginnen und sich über die gesamte Lebensspanne erstrecken. Selbstregulierungsfähigkeiten können in allen Bereichen des Lebens, sei es im Kindergarten, in der weiterführenden Schule oder am Arbeitsplatz, angewendet werden, um die vielfältigen Anforderungen, mit denen man in der heutigen Gesellschaft konfrontiert wird, bewältigen zu können. Hinsichtlich der Wahl des akademischen Kontextes konzentriert sich die vorliegende Dissertation auf die Gruppe der Schüler im Lateinunterricht, weil diese mit unterschiedlichsten komplexen Lernsituationen konfrontiert werden, vor allem dann, wenn sie lateinische Originaltexte übersetzen müssen (Doepner, 2008). Für die Steuerung und Strukturierung des Übersetzungsprozesses müssen Schüler selbstregulative Strategien anwenden können, die wiederum die Anwendung domänenspezifischer Strategien sinnvoll ergänzen (cf. Perels, Gürtler, & Schmitz, 2005).

Der vorliegenden Dissertation liegen drei Studien zugrunde, die theoretisch auf einer adaptierten Version des Rahmenmodells der Selbstregulation von Pintrich (2000) basieren. In

dieser Modellversion werden die verschiedenen Phasen des selbstregulierten Lernens (Planung, Überwachung, Kontrolle, Reflexion) den Phasen des Übersetzungsprozesses (Dekodierung, Rekodierung, Umstrukturierung; vgl. Glücklich, 2008; Kuhlmann, 2009) gegenübergestellt, um die selbstregulativen Strategien auf die Bewältigung der Übersetzung zu übertragen.

Das Ziel der Studien 1 und 2 war es zu prüfen, ob die selbstregulativen Fähigkeiten und Übersetzungskompetenzen der Schüler durch verschiedene Interventionsansätze gefördert werden können. Die Ergebnisse zeigen allgemein, dass die Interventionen in Bezug auf die Verbesserung dieser Fähigkeiten wirksam waren.

Studie 3 untersuchte die zugrunde liegende Struktur des im Rahmen der vorliegenden Dissertation entwickelten theoretischen Modells des selbstregulierten Lernens und der Übersetzungsarbeit. Es wurde angenommen, dass zwischen den interessierenden Variablen bidirektionale Einflüsse bestehen. Die Vorhersagekraft der Variablen SRL für die lateinische Übersetzungsleistung sowie die Betrachtung der umgekehrten Wirkrichtung wurden mithilfe eines Cross-Lagged-Panel-Designs analysiert.

Insgesamt heben die vorgestellten Studien die Bedeutung des selbstregulierten Lernens für den Lernprozess der Schüler sowie für deren Umgang mit geeigneten Strategien hervor. Folglich trug die vorliegende Dissertation sowohl zur Forschung als auch zur Praxis bei, indem sie verschiedene Interventionsansätze erfolgreich in eine weitgehend unerforschte Domäne implementieren konnte.

1. General introduction

1.1 Relevance of self-regulated learning

The continuous technological revolution and the cascades of information we see ourselves swamped with reinforce the importance of suitable strategies that help managing the demands of today's society. Getting used to the continuous and lifelong need to adapt one's own behavior and knowledge through self-evident and conscious application of strategies requires starting early with strategy instruction and promotion.

In this context, the results of the international comparison studies TIMSS and PISA (e.g., PISA, 2004) revealed the necessity of supporting cross-curricular competencies (including self-regulated learning) with regard to improving academic achievement and performance. That is why self-regulated learning (SRL) should be taken into consideration both in curriculum development and lesson planning.

Furthermore, there are empirical studies that bolster the importance of self-regulatory competencies by demonstrating a positive impact of SRL on academic achievement (e.g., Fuchs et al., 2003; Nota, Soresi, & Zimmerman, 2004; Zimmerman & Martinez-Pons, 1986).

Against this background, in order to support SRL effectively and to make practitioners aware of its relevance for the development of students' learning behavior, we designed two intervention programs by means of which we examined different possibilities of fostering SRL at school.

1.2 Definition of the self-regulated learning construct

Due to numerous traditions of research and different thematic focuses, there are various conceptual descriptions of SRL in the psycho-pedagogical literature that distinguish between several model assumptions and approaches to definitions. Beyond that, a number of different terminologies (e.g., autonomous learning, self-directed learning) are discussed and regarded as being part of (or synonymous to) SRL.

Additionally, the present state of research distinguishes between the concepts *self-regulation*, *self-regulated learning*, and *metacognition* (Dinsmore, Alexander, & Loughlin, 2008). This differentiation is not trivial with regard to a clear operationalization of the constructs. While self-regulation describes a holistic and overall concept by focusing on the interaction of the person with the environment, SRL refers mainly to academic learning. Metacognition, however, is conceptualized as monitoring or thinking about one's own cognition (Flavell, 1979), paying more attention to the learner's[3] mind than to the interaction between the person and the environment, or to actual activities the person performs (Dinsmore et al., 2008). In addition, metacognition is considered to consist of three different kinds of metacognitive awareness: declarative, procedural, and conditional knowledge (Brown, 1987; Paris & Byrnes, 1989).

According to Schraw and Moshman (1995), declarative knowledge refers to the knowledge about one's own cognitive processes and about factors that are decisive for one's performance. Procedural knowledge includes knowledge about the actual control and realization of procedural skills. Conditional knowledge finally considers the decision of when and why the application of specific cognitive actions is appropriate.

As becomes obvious from this discussion, a distinct classification between self-regulation, SRL, and metacognition is necessary, especially considering that there has been an inconsistent and inaccurate employment of taxonomies in a large body of research studies (cf.

[3] The term "learner" refers to students throughout the document, as the study focuses on an academic setting.

Dinsmore et al., 2008). While some studies have considered metacognition as construct independent from self-regulation, or self-regulation as being subordinate (e.g., Kluwe, 1987), others understand it as a facet of self-regulation (Pintrich, 2000; Zimmerman, 2000), with self-regulation being superordinate. The latter approach refers to the social–cognitive perspective of Bandura (1977) that also integrated motivational and social–emotional processes.

The present thesis adopted the assumption that SRL integrates metacognition as a strategic aspect. Therefore, our studies referred to an adaptation of Pintrich's (2000) framework of self-regulation, which emphasizes the procedural character of SRL comprising four phases (planning, monitoring, control, reflection) during which self-regulation activities are assigned to (meta)cognitive, motivational, behavioral, and contextual processes. According to this approach and in order to form a definition which is as stringent and unambiguous as possible, we considered SRL to be "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000, p. 453).

1.3 The framework of self-regulation (Pintrich, 2000)

Apart from Pintrich's (2000) framework of self-regulation, other different models of SRL in the academic context have been developed and can be differentiated by the adoption of the perspective the authors take on SRL. In general, there is a distinction between process and component models.

Boekaerts (1999), for example, developed a three-layered model of SRL, which differentiates between cognitive, metacognitive, and motivational aspects and which is classified as a component model. The innermost layer refers to the regulation of processing modes, the middle layer pertains to the regulation of learning processes, and the outermost layer concerns the regulation of the self by deciding between goals and resources.

Process models (cf. Schmitz & Wiese, 2006; Zimmerman, 2000), however, consider learning as a cumulative process, whereby the current state of learning is influenced by preceding learning activities and behavior as well as by situational factors of the learning environment. While component models describe SRL in terms of competencies that are (a) beneficial for the development of SRL and (b) regarded as a person's enduring attributes, the procedural perspective refers to a cyclical character of learning, including different successive phases during which behavior is elaborated and adapted, if necessary.

Pintrich's (2000) framework, which has several similarities with the social cognitive model of self-regulation by Zimmerman (1989), adopted the process-oriented approach postulating different phases of self-regulation, whereby it integrates different areas. Thus, it emphasizes the dynamic nature of regulation.

In detail, Pintrich (2000) divided the self-regulation process into four phases (planning and activation, monitoring, control, and reaction and reflection), which we now envisage to operate in different areas (cognition, motivation, behavior, and context). The first phase, *planning and activation*, includes the regulation of goals and prior knowledge, and the activation of metacognitive knowledge.

The *monitoring phase* concerns the learners' awareness in terms of their own learning behavior and activities. Closely related to this are *control* processes (Corno, 2004) that learners use to adapt, regulate, and change their cognitions (e.g., adaptation of strategy application), motivation (e.g., self-motivation), behavior (e.g., help-seeking), and context (e.g., elimination of distractions).

Finally, the *reaction* and *reflection phase* involves the evaluation of the learners' performance and strategy application, whereas the attribution style (Weiner, 1986) has an important influence on the level of satisfaction with one's own achievements. The results of their own assessment pave the way for the future process of learning.

The reasons for taking Pintrich's (2000) framework as a theoretical basis include, first, the fact that the employment of Zimmerman's model predominates in the literature of self-regulated learning and we therefore had the intention to contribute to the generalization of Pintrich's (2000) framework by adapting it to a new domain and by focusing new research questions. Second, its accentuation of the application of learning strategies best matched our objective to use strategy application as a medium of analytical translation competency in Latin.

1.4 Promoting self-regulated learning and academic achievement

The implementation of intervention programs at school is most appropriate in order to find out whether students' skills can be promoted and whether these skills have a transfer effect on different aspects of academic achievement (e.g., grades, professional success). That is why various studies deal with investigating whether SRL can be fostered effectively and made favorable for increasing academic achievement. Concerning the forms of intervention, many variations have been envisaged, and have been shown to be effective (cf. Kistner et al., 2010). One variation refers to the domain in which SRL is implemented. There is a large body of research in SRL that has undertaken interventions in fields such as mathematics (Fuchs et al., 2003), science (Azevedo, Witherspoon, Chauncey, Burkett, & Fike, 2009), writing (Graham, Harris, & Mason, 2005), reading (Souvignier & Mokhlesgerami, 2006), text comprehension (Leopold, den Elzen-Rump, & Leutner, 2007), or learning with hypermedia (Azevedo, 2005). All these studies were able to show that SRL can be regarded as a valuable supplement of domain-specific strategy instruction because it increases the effects on the competencies that are in the focus of the domain concerned (e.g., reading comprehension, mathematical problem solving). Generally, studies have shown that the connection to domain-specific competencies is most effective with regard to the promotion of both cross-curricular and subject-related abilities (Perels et al., 2005; Seidel & Shavelson, 2007).

Another variation concerns the way the interventions' contents are transferred or mediated. An intervention can be directly targeted to the population (e.g., students) whose SRL is supposed to be improved. Indirect intervention, however, addresses individuals (e.g., teachers, parents) who are responsible for creating learning environments that are beneficial for supporting the respective skills (De Corte, Verschaffel, & Masui, 2004). The idea of the indirect approach is that the addressees take up the position of multipliers by mediating between the interventions' contents and the actual target group (e.g., students) whose skills are intended to be fostered (Perels, Merget-Kullmann, Wende, Schmitz, & Buchbinder, 2009; Otto, 2007). In the school context, teachers play a decisive role in the promotion of SRL, whereby their knowledge and beliefs about how to foster this competency in their students relate to the implementation of SRL strategies in the classroom (Dignath-van Ewijk & van der Werf, 2012).

The importance and effectiveness of intervention programs in terms of promoting SRL and academic achievement has been revealed in various previous studies within different contexts: preschool (Perels et al., 2009); primary school (Leidinger & Perels, 2012; Stöger, Sontag, & Ziegler, 2009); secondary school (Keller, Ogrin, Ruppert, & Schmitz, 2013; Perels, Dignath, & Schmitz, 2009); PhD studies (Pickl, 2007; Schmidt, 2009); workplace (Leutner & Leopold, 2003; Siadaty et al., 2012).

Obviously, SRL skills should be promoted as early as possible (Schneider & Lockl, 2002) so that the individual can fall back on appropriate strategies in difficult situations, whether in kindergarten, at school, at the university, or on the job. Against the background of the life-long learning debate, SRL skills can help the individual level up in life and work and be able to respond to change, challenges, and setbacks.

1.5 Latin translation competence as domain-specific component

Especially falling back on previous intervention studies that focused on reading comprehension, we wanted to show that these interventions' approach can be transferred and

replicated for translating texts from a foreign language into a first language. In the study of Souvignier and Mokhlesgerami (2006), for example, students acquired cognitive and metacognitive strategies to summarize a text (organization) and to go beyond a text (elaboration). We postulated that the acquisition of these strategies is also relevant for the translation of texts because the usage of organization and elaboration strategies helps to structure a text, and promotes a deeper understanding, thus providing a basis for the actual translation.

Consequently, we made decisions about the intervention's contents (teaching of self-regulatory and translation strategies), but the intervention then had to be integrated into a specific school subject in order to support the transfer of strategy instruction to the domain-specific contents. The decision to choose Latin as a research domain, and thus a dead language to assess active language processing, certainly requires a special explanation. In reply, we would like to stress our conviction that Latin has a past, but also a future that has to be created in the interests and for the benefit of today's young people. In this context, we specifically thought of both the indirect value Latin translation has for verbal competence (e.g., comprehending complex connections, drawing conclusions; DeVane, 1997; Newmark, 1988), and problem solving, as well as of its connection with reading comprehension (Kennedy, 2006; Masciantonio, 1977). Handling Latin vocabulary and original texts in Latin promotes language processing skills with regard to syntax, semantics, or morphology (Keip & Doepner, 2009), and sensitizes students toward dealing with and comprehending language in general (LaFleur, 1981).

Beyond that, there are other appropriate arguments for the value of learning Latin. The departments of classical studies advertise for members and students by postulating that basic skills in Latin make it possible to expand the use of foreign words and technical terms. Additionally, it has been argued that proficiency in Latin helps one to learn other languages, especially Romance languages that find their roots in the Latin language (Mavrogenes, 1987).

Therefore, the promotion of Latin at school also has its value for other foreign languages that are part of the curriculum.

Dorothy Sayers (1947) best summarized all these arguments: “I will say at once, quite firmly, that the best grounding for education is the Latin grammar. I say this not because Latin is traditional and medieval, but simply because even a rudimentary knowledge of Latin cuts down the labor and pains of learning almost any other subject by at least 50 percent” (From the National Review).

Haag and Stern (2003), however, broke this myth by revealing that learning Latin has no benefits for the acquisition of other languages. The study’s aim was to examine whether Latin or French is a better linguistic precondition for learning Spanish. In response, Wirth (2011) uncovered conceptual and methodological deficiencies of that study. Latin language capabilities were not assessed by quantitative analysis, but by visits to Latin class in a dichotomous way. Differences in class membership or baseline differences in students’ language requirements were not taken into account or properly discussed. The situation is aggravated by the fact that there was no control group, such that the experimental character of the study is questionable. Furthermore, language competency referred to grammar and vocabulary errors rather than to central aspects of Latin language instruction (Keip & Doepner, 2009), such as strategy application or organization of the translation process (e.g., text preparation before actual translation). Finally, any information with regard to the Spanish test (e.g., difficulty index) was missing. Therefore, the dependent variables were not sufficiently operationalized. While we would like to avoid depreciating Haag and Stern’s (2003) findings, we would like to encourage a more holistic consideration of the Latin language and to warn against jumping to the conclusion that learning Latin is useless and irrelevant for today’s young people. If we simply succumbed to the study’s findings, we would have to stop exploring Latin language and would embrace the prejudice of Latin being a dead language.

However, what about those students who have to (or even want to) learn Latin because it is compulsory at their school? Do they not deserve research contributions to keep Latin language instruction up-to-date? Doubtless, the translation of original Latin texts is the ultimate goal of teaching Latin and represents a great challenge (Kuhlmann, 2014) to successfully formulating an understandable text in the target language, due to unusual sentence structures. Texts in English or Spanish that deal with topics of everyday life simply are culturally closer to the students than original Latin texts that seem to be rather artificial for today's learners (Kuhlmann, 2014). That is why we aimed to establish a common ground from which students will be equipped with strategies that support the analysis and understanding of texts in Latin. Generally, against the background of competence orientation that is asked for in all subjects, we aimed to examine whether SRL can be used as a framework for implementing strategy instruction to optimize effects on text translation in Latin.

1.6 Framework of self-regulated learning and translation

The general model of translation of Nida and Taber (1969) was employed in order to link the cross-curricular strategies (SRL strategies) to domain-specific strategies. For that purpose, we transferred this model to the context of Latin translation and integrated the translation process as a domain-specific component into the framework of self-regulation by Pintrich (2000). The idea of juxtaposing the different kinds of strategies followed the concept of Perels, Bruder, Bruder, and Schmitz (2004), who integrated problem-solving and SRL strategies in one model. Our postulation was that the combination of both SRL and translation strategies is most effective in fostering expertise in Latin translation, but also in transferring the acquired competencies to other contents (e.g., reading comprehension) and subjects (e.g., English for speakers of other languages).

In parallel to the SRL process, the translation process distinguished three phases (in conformity with Glücklich, 2008; Kuhlmann, 2009): *decoding* (text preparation), *transfer/recoding* (strategies for transposing the text's content into the target language) and *restructuring* (strategy evaluation, correcting). We specifically added the phase of restructuring because we wanted to stress the importance of strategy evaluation in parallel with the reflection phase of the SRL process. Even though there is no empirical evidence for a pre-determined order (Kuhlmann, 2014), we chose the decoding phase as basis for the recoding phase, especially for the translation of texts with complex sentence structures.

Hence, the focus of the *decoding* phase was on the instruction of the following strategies (cf. Souvignier & Mokhlesgerami, 2006):

1.) *Organization strategies* are concerned with the structuring of the text and with the gathering of information in the first reading. They include clarifying of unknown vocabulary and analyzing the grammatical elements and syntactic functions (Keip & Doepner, 2010).

2.) *Elaboration strategies* involve the development of a first understanding in terms of the basic messages of the text (e.g., thinking about the headline, taking notes while reading the text). In this context, the activation of prior knowledge (e.g., "What do I already know about this?") helps to incite the linkage of concepts.

The conscious use of these strategies is important in order to create a reasonable basis for the actual translation in the recoding phase and to positively affect the whole translation process. Table 1 depicts central indicators of an elaborated decoding process:

Table 1

Indicators of the Decoding Process

Focus	**Element**	**Significance for actual translation**
Sentence parts	Subject Predicate Object	▪ Identifying the main and meaningful elements
Connectors	Linking words (e.g., cum, quamquam, et…et)	▪ Syntactical subdivision of sentence structures ▪ Facilitation of long sentence constructions ▪ Establishing relations between sentences
Phrases	Participles Constructions (e.g., AcI-construction[4], Ablative absolute)	▪ Identification of independent but meaningful phrases

In the *recoding* phase, the learners start producing the actual translation, whereby word choice and expression have to adhere to target language norms in order to recode the original text accurately. Linked to this is a profound semantic analysis. The idea of drawing the students' attention to specific meanings of words and sentences was to sensitize them for the thematic progression and to determine their comprehension. Thus, students were encouraged to paraphrase, ask questions, and formulate expectations to promote deeper understanding.

After completion of the translation, in the phase of *restructuring*, the evaluation of strategy application and translation behavior sets in. Depending on the evaluation result and the level of satisfaction, corrections and adjustments are made. The ultimate objective should be to conform as closely as possible to conventions of the target language. The final model provides a framework that serves as theoretical basis for the conceptual design, implementation, and realization of our intervention studies.

[4] Accusativus cum infinitivo

1.7 Contribution of the present thesis

This thesis is significant in its contribution to research on SRL as well as to Latin didactics. The added value provided for research was, first, the adoption of the framework of self-regulation by Pintrich (2000) for the implementation of intervention studies in regular class, and its adaptation and transfer to a new domain. Second, we developed effective intervention programs that were successful in increasing students' self-regulatory behavior and translation competency by employing different training approaches. The efficacy of the intervention programs were tested both in a physical and virtual format. Web-based learning platforms, such as Moodle (*M*odular *O*bject-*O*riented *D*ynamic *L*earning *E*nvironment), offer new ways of providing material and organizing the learning process. That is why it was a great challenge to train students by using the support of new technologies.

Furthermore, we tested for change in SRL over time by examining whether the changes are associated with academic achievement. At first glance, one could argue that this has been extensively studied (e.g., Perels et al., 2005). However, even though it is widely known and has been empirically verified that SRL is an effective predictor of academic achievement in various fields, this impact has not been examined yet for Latin translation achievement. Beyond that, the reverse effect of academic achievement on SRL is still largely unexamined. Therefore, the contribution was to illustrate that SRL skills predict the learners' abilities to deal with Latin texts and help to track whether the use of translation strategies will lead to a satisfactory and accurate processing of texts. In this respect, we designed a model that was the first attempt at transferring SRL strategies to Latin translation strategies, postulating different phases and components of the SRL and Latin translation process.

To sum up, the present thesis proceeded from the assumption that SRL must be regarded as an important competency for dealing with difficult tasks in Latin (cf. Corno & Randi, 1999), and that systematic programs should be implemented into regular class as early as possible in order to foster students' competence development. With this in mind, our

research not only contributes to a topic of high practical relevance, but also addresses inconsistencies and knowledge gaps in the theoretical literature and empirical analysis, as well as in practical terms.

1.8 Deduction of research questions

Each study that is represented in this thesis dealt with different research questions.

Study 1:

The central questions of Study 1 were:

- Is it possible to promote self-regulated learning and translation skills of students?
  - Which form of training intervention is most effective?

    Variation: Strategy instruction
    - ✓ Can SRL be implemented in combination with Latin translation strategies?
    - ✓ Is the combined strategy approach more effective than the isolated instruction of domain-specific translation strategies?
  - Are there any long-term effects due to the training intervention?

To examine these questions, Study 1 focused on the comparison of three different training conditions: (a) a combined training group (ComG) that was taught both SRL and translation strategies, (b) a translation group (TG) that was introduced to translation strategies only, and (c) a control group (CG) that was not involved in the training program. The dependent measures were analyzed using a 3 (pretest/posttest/follow-up-test) × 3 (training conditions) analysis of variance with time as repeated measurement factor.

Study 2:

In Study 2, the research questions that were deducted were as follows:

- ❖ Is it possible to promote self-regulated learning and translation skills of students?
  - Which form of training intervention is most effective?

    Variation: Direction for addressing the target group
    - ✓ Is a direct or indirect training approach more effective?
    - ✓ Is the combination of both direct and indirect training more effective than the isolated approaches?
  - Can SRL and Latin translation strategies be implemented into a Web-based learning platform?

Study 2 also tested training effects, but chose a different form of intervention that was implemented into the Web-based learning platform Moodle. The focus was not on the presented strategies but on the addressees of the training program that were assigned to the following training approaches: (a) a direct training (DT) where students performed the training tasks autonomously via Moodle, and (b) an indirect training (IT) where teachers were trained and asked to transfer their strategy knowledge to their students. In order to investigate the effectiveness of the intervention, a $2 \times 2 \times 2$ factorial design with the factors DT (+ /-), IT (+ /-), and time (pre-/ posttest) were realized from which eventually four groups resulted: a single DT ($DT^{+}IT$), a single IT ($DT^{-}IT^{+}$), a combination ($DT^{+}IT^{+}$), and a control condition ($DT^{-}IT^{-}$).

Study 3:

Finally, Study 3 was concerned with the following questions:

- ❖ Is there a bidirectional relationship between SRL and academic achievement (Latin translation achievement)?

- Which construct holds the strongest predictive value for each other?

To evaluate these questions, a cross-lagged-panel design was utilized to test for bidirectional relations between the study variables.

2. Method

2.1 Sample

Latin students represent the target group of all three studies. Altogether, 109 tenth-grade students participated in Study 1 and were distributed over three different groups. The combined training group (ComG) consisted of 41 students, the translation group (TG) consisted of 32, and the control group (CG) consisted of 36 students. The mean age of participants was 15.72 (*SD* = 0.56). In all, 53.2% of the students were female. The catchment area included the different administrative districts of the Saarland.

Study 2 included 336 students from secondary schools, of which 51.79% were female. The sample had a mean age of 15.87 (*SD* = 7.98). The catchment area was extended to the federal state of Hesse. For analyses, a matched sample of 274 students (52.19% female) with a mean age of 15.12 (*SD* = 1.13) was taken into account. The distribution of the different groups was as follows: The single direct training group (sDT) consisted of 47 students, the single indirect training group (sIT) consisted of 54, the combined training group (ComT) consisted of 36 students, and the control group (CG) consisted of 137 students.

Study 3, based on the original, unmatched sample of Study 2, comprising 332 students with a mean age of 15.87 (*SD* = 7.98), and including 174 girls.

2.2 Design

In both Study 1 and Study 2, a pretest-posttest control group design with time as repeated measurement was employed, whereby Study 1 offered one more wave of data (follow-up-measurement). In Study 1, a 3 (*pretest/posttest/follow-up-test*) × 3 (*training conditions*) design was used, whereas in Study 2, we were able to apply a complete 2 (*pretest/posttest*) × 2 (*direct training*) × 2 (*indirect training*) design. In Study 3, a cross-lagged panel design was utilized to test for bidirectional relations between the study variables.

Repeated measurement designs generally allow the control of individual differences between the subjects (Bortz, 2005), which requires that the data from the different experimental conditions be related because they refer to the same people, explaining why different assumptions had to be taken into consideration.

First, we assumed that the variance of the dependent variable in each group was equal (*Homogeinity of variance*), whereas the assumption of *sphericity* required that the repeated measures showed homogeneity of variances and covariances for each level of the within-subjects variable. As the ANOVA is generally robust to small deviations from this assumption, we would only have needed to be concerned with large deviations with a very serious imbalance of sample size between the treatment groups (Bühner & Ziegler, 2009). Further assumptions referred to the *normal distribution* of the dependent variable in the sample, as well as to the precondition that the dependent variable was *continuous scaled* (Bühner & Ziegler, 2009).

2.3 Assessment of self-regulated learning

For the assessment of the study variables (self-regulatory abilities, achievement variables), a self-regulation questionnaire and an experimenter developed criterion-referenced achievement test were designed and used in all studies so that we developed a combination of self-report data and objective outcomes (test scores, marks). In order to minimize measurement error, we adhered to the three quality criteria that determine quality of information: objectivity, reliability and validity.

Both the questionnaire and the achievement tests were standardized. When evaluating the translation test, previously defined categories were used in order to ensure objectivity. Furthermore, two research assistants independently rated the scores. Hence, the inter-rater reliabilities were considered, and turned out to be satisfactory.

Concerning the reliability measures, we tested for internal consistencies and retest-reliability, which proved to be satisfactory. In terms of the validity of the instruments,

different validity criteria were taken into account: (a) content validity, (b) criterion validity, and (c) construct validity. Meeting these criteria was especially important considering the current discussion with respect to the assessment of SRL.

The validity of the questionnaires was generally ascertained by using items from established instruments, whereas some items were newly developed, if necessary. With regard to the achievement test, experts lent their support to the design of the texts in order to ensure content validity.

With regard to the criterion of external validity, we were able to set SRL in relation to an achievement variable, and thus to predict learning outcomes (cf. Study 3). More specifically, we also met the convergent criterion-related validity in Study 1 and 2 by correlating the scores gained by the achievement test with the students' last examination grades and report marks. Furthermore, the solutions obtained from factor analysis procedures provided a reasonable justification to construct validity of the study variables.

In Study 2, we additionally tried to meet a multi-method approach by applying both on-line and off-line information (Veenman, 2005) to assess SRL. This way, the criterion of concurrent criterion validity was addressed by interrelating SRL competency assessed by a questionnaire with other training indicators assessed by the Web-based learning platform Moodle:

1) Trace Data: Digital traces of students' learning behavior were gathered via Moodle in order to construct profiles of the frequency of SRL activity across participants.

2) Content analysis of students' submitted worksheets: The quality of the students' submitted worksheets (e.g., the preparation of time schedules) was analyzed and linked to the self-report data.

With that in mind, the present thesis took a step in the direction of considering more multi-method techniques for assessing SRL, and thus of trying to better understand the complex nature of SRL. Chapter 8.3 will discuss in what way the existing reality of the

school-based environment is obstructive to a smooth execution of a multi-method approach and why future studies should nevertheless continue to take into account both on-line and off-line data.

3. Data analysis

3.1 Evaluation of training effects

The evaluation methods of the different studies presented in this thesis were based on the abovementioned considerations. For training evaluation (pretest/posttest/follow-up-test comparisons), we used multivariate and univariate analyses of variance with time as a repeated measurement factor. In case of significant pretest differences between the groups, we employed analyses of covariance, with the pretest value as covariate, to control these differences.

In Study 2, we employed the propensity score matching method (cf. Austin, 2011; Bacher, 2002); that is, the subsamples of the (aggregated) experimental groups and the control group were matched to control for baseline differences regarding a circumscribed set of relevant variables, aiming at creating a more homogenous pool of control participants.

In line with the multi-method approach and the requirement of validating off-line data against on-line data, trace data analysis was additionally taken into consideration. At this point, it has to be pointed out that it was originally planned to conduct multi-level analyses in order to gain a broader perspective of the effectiveness of our interventions. The idea was to organize the data at more than one level (e.g., students, teachers, classroom, and school). For that purpose, we assessed teachers' SRL abilities and their attitude toward the necessity of fostering students' SRL and translation competency. Because of a low response rate on the part of the teachers, however, we decided to analyze our data at the students' level only.

3.2 Theory testing

In Study 3, we tested possible causal relationships among the study variables (SRL and Latin translation achievement) by means of structural equation modeling (SEM), employing both confirmatory and exploratory modeling. Commonly, a model is tested against the obtained measurement data in order to make reliable statements with regard to how well

the model fits the data. The measurement model shows the relations between latent variables and their indicators, which is depicted in the exploratory and confirmatory factor analysis models. The structural model demonstrates the potential causal dependencies between the endogenous and exogenous variables, and is depicted in a path diagram.

Additionally, a cross-lagged panel analysis was applied with the aim to test for bidirectional relations and to figure out which construct holds the strongest predictive value for each other.

4. Overview of the results of the different studies

The present thesis includes three studies that are based on the theoretical and methodological considerations outlined above. Before presenting the different studies in detail, the following sections provide a general overview of the results of each study.

4.1 Study 1

Study 1 focused on the development, realization, and evaluation of an intervention program for 109 tenth-grade students, which aimed at the promotion of students' SRL and academic achievement in Latin classes. Three different conditions were compared: (a) combined training group (ComG) that was taught both SRL and translation strategies, (b) translation group (TG) that was introduced to translation strategies only, and (c) control group (CG) that was not involved in a training program.

Our assumptions were that:

1) The training groups would outperform the control group in terms of self-regulatory skills as well as translation competency,

2) The ComG would show the highest learning gains,

3) There would not be a significant change of abilities between posttest and a stability measurement (follow-up-test), but that the differences between the groups would stay as postulated.

The dependent measures were analyzed using a 3 (pretest/posttest/follow-up-test) × 3 (training conditions) analysis of variance with time as repeated measurement factor. The results indicated interaction effects between time and group for SRL in favor of the intervention groups (Assumption 1). Regarding the self-regulatory skills, the ComG showed only a marginally higher improvement than the TG, which was against our expectation (Assumption 2). Regarding the translation competencies as well as the strategy application, the results revealed significant training effects in comparison to the control group, with the TG showing the highest increase.

In terms of the stability measurement (Assumption 3), no significant change for the variables between posttest and follow-up-test were revealed, except for the achievement variables in the TG. Nonetheless, no additional effect occurred after the intervention over a period of eight weeks.

The SRL abilities remained stable in both groups, showing only an insignificant decrease. With regard to the translation competency as well as the translation strategy application, the ComG was stable after the intervention and revealed an insignificant increase, whereas a significant decrease in both achievement variables was observed for the TG.

To conclude, the findings of the pre/post-follow-up test evaluation indicated that it is possible to enhance self-regulatory and translation competencies by an intervention program within regular Latin class, resulting in a predominance of the intervention groups over the control group as well as in stable training effects even eight weeks after the actual intervention. The predominance of the combined training approach, which was revealed in other studies for mathematics, could not be verified and consequently raised the question of whether this superior effect could represent a matter of domain.

Reference:

Wagner, D. & Perels, F. (2012). Evaluation of an Intervention Program to Foster Self-Regulated Learning and Academic Achievement in Latin Instruction. *ISRN Education, vol. 2012 (Article ID 848562, doi:10.5402/2012/848562).*

4.2 Study 2

While Study 1 revealed—even if the result was only marginally significant—that a combined impartment of self-regulated learning and translation competency is possible, we proceeded from the assumption that both constructs overlap, and thus trained SRL and domain-specific strategies in combination rather than in isolation.

As an important innovation, Study 2 presents the design of a Web-based learning environment that created a multimedia incorporation of the intervention measures. In this

way, the study accommodated the current progressing social development toward an information and communication society. Moreover, the multi-methodological approach, which was followed in Study 2, helped to realize the different objectives more elaborately. Generally, Study 2 was like Study 1 aiming at the evaluation of an intervention program's effectiveness in terms of students' SRL and Latin translation achievement.

However, in Study 2 we chose a different form of intervention. It was not the presented strategies, but the addressees of the training program, that were varied by employing a direct (DT) and indirect (IT) training approach. Both training approaches were conducted by means of the Web-based learning platform Moodle that supported the impartment of strategies. In the DT, the *students* acquired the training contents through self-regulatory means via Moodle without additional support by their teachers. By comparison, the *teachers* who were involved in the IT acquired the training contents via Moodle as well, but were additionally asked to transfer to their students that which they had learned.

In order to investigate the effectiveness of the intervention regarding SRL skills and translation competency (accuracy, self-reported, and actual strategy use), a 2 × 2 × 2 factorial design, with the factors DT (+ /-), IT (+ /-) and time (pre-/ posttest), was realized with 274 lower secondary students. All in all, four groups emerged: a single DT ($DT^{+}IT^{-}$), a single IT ($DT^{-}IT^{+}$), a combination ($DT^{+}IT^{+}$), and a control condition ($DT^{-}IT^{-}$). Our assumptions were that:

1) Each training form via Moodle would have a significant, positive impact on students' SRL abilities and translation competency.

2) All training groups would outperform the control group, which was not involved in the training procedure.

3) Specifically, we anticipated that a combination of the training measures would lead to higher learning gains in students than each training form would in isolation. As a

third expectation, we postulated that the single training groups would differ with respect to the dependent variables.

The findings showed that the intervention was effective in terms of the enhancement of SRL and translation strategy skills (Assumption 1). All training groups significantly outperformed the control condition (Assumption 2). Surprisingly, the single DT showed the highest learning gains for all variables. However, the combination of the training approaches (Assumption 3) did not result in a predominant effect. The lacking existence of synergetic effects led to the conclusion that reciprocal interferences might have caused this pattern of result.

Reference:

Wagner, D., Dörrenbächer, S. & Perels, F. (submitted paper). Enhancing self-regulated learning and Latin translation competency using the learning platform Moodle. *Education Research International.*

4.3 Study 3

In Study 3, finally, possible causal relationships among SRL and Latin translation achievement were tested by using a cross-lagged panel analysis. Hence, our research questions aimed at exploring the bidirectional relationship between SRL and academic achievement by using the example of Latin translation and figuring out which construct would hold the strongest predictive value for each other.

The cross-lagged panel analysis revealed a significant impact of SRL on Latin translation achievement, whereas the reciprocal relationship could not be confirmed. Notwithstanding, current research was enlarged to a further domain and subject, and enriched by important findings regarding the role of SRL for students' academic achievement. Beyond that, the study is supposed to encourage future studies to test the impact of the achievement variable on SRL by considering possible moderator variables. In general, our study provides crucial implications and ideas for the development of future interventions.

Reference:

Wagner, D. & Perels, F. (submitted paper). Investigating the reciprocal relationship between self-regulated learning and academic achievement in Latin translation. *Psychology Learning & Teaching.*

5. Study 1 - Evaluation of an intervention program to foster self-regulated learning and academic achievement in Latin instruction

5.1 Abstract

The study's aim was to develop two different intervention programs and to evaluate their contribution to students' self-regulated learning and academic achievement in Latin classes. The concept of our study referred to a process-focused model of self-regulated learning that divides the phases of the self-regulated learning process into different areas, which we applied to domain-specific translation strategies. Within a pre-, post- and follow-up-test design with 109 tenth graders, self-regulated learning skills, translation competency as well as translation strategy application were assessed using both a self-regulation questionnaire and a standardized translation test. Three different conditions were compared: (a) combined training group (ComG)—self-regulated learning and translation, (b) translation training only (TG), and (c) control group (CG). The intervention consisted of nine sessions spread over a period of three weeks. Results of analyses of variance with time as a repeated measurement indicated interaction effects between time and group for self-regulated learning in favor of the intervention groups. The ComG showed marginally higher self-regulatory skills than the TG. Regarding the translation competencies as well as the strategy application, the results revealed significant training effects in comparison to the control group, with the TG showing the highest increase.

Keywords: self-regulated learning, translation strategies, intervention program, Latin instruction

5.2 Introduction

Today's fast-changing demands of the environment increasingly promote the necessity of self-regulatory competencies and the awareness of the importance of lifelong learning skills (Zimmerman, 2001). That is why it is essential to prepare young people for the challenge of both professional and private life beyond school beginning as early as their formative school years or even in kindergarten (Perels et al., 2009; Schneider & Lockl, 2002). In order to contribute to the promotion of self-regulated learning strategies in school, we implemented an intervention program within regular class. The present study has the aim to contribute to the regulation of strategy use in Latin instruction and thus to shed light on studies on self-regulated learning in a new domain-specific field. Specifically, our study contributes to strategic approaches to texts in Latin and intends to prove that self-regulated learning is of particular importance for translation competency as well as translation strategy application.

The main goal of Latin instruction is to prepare learners for the comprehension and interpretation of original texts in Latin. That is why translation work, respectively the precise recoding of Latin texts into the target language, is the most important part in Latin instruction. In general, translation work in Latin class is regarded as one of the most challenging forms of language work (Doepner, 2008). It is argued that translating skills are comparable with problem-solving skills (Sharoff, 2006), as during the translation process problems arise and the right strategies have to be found to solve them. Consequently, Latin students have to be equipped with self-regulatory strategies that support their translating. Additionally, even though it is controversial that learning Latin has transfer effects on the acquisition of other foreign languages (Haag & Stern, 2003), research could show that translation skills in Latin contribute to reading literacy (Masciantonio, 1977; Thies, 2003) and verbal competence (e.g., comprehending complex connections, drawing conclusions, reflecting precise understanding) (LaFleur, 1981). Since the relevance of the texts' contents in Latin may not be very evident

for young people sometimes, Latin instruction has to adapt to the learning habits of today's young people and has to refocus the teaching of Latin as a language. In addition to innovative teaching methods (Keip & Doepner, 2010) and the demand for reflection and comprehension skills, active and independent learning plays an important role of competency-based education. It is vital to convey the message that the ability to deal with complex Latin texts can be considered as a path to important proficiencies that go beyond the practicing of vocabulary and grammar, but also include analytical skills that are essential for lifelong learning (LaFleur, 1981).

The major aim of the present study was to evaluate the effectiveness of different kinds of training interventions. Specifically, we wanted to demonstrate that students benefit more from a combined training of self-regulatory and Latin translation strategies than from a segregated impartment of these strategies.

The concept of our trainings referred to the theoretical framework of Pintrich (2000), who defined self-regulated learning as ‘‘an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment’’ (Pintrich, 2000, p. 453). Pintrich's (2000) model emphasizes the procedural character of self-regulated learning by classifying the learning process into four phases of regulation (forethought, planning, and activation; monitoring; control; reaction and reflection). These regulatory activities are further subdivided in four regulation areas (motivation, cognition, behavior, and context), which for their part consist of components representing favorable strategies of self-regulated learning (e.g., time planning, resource management strategies). As there is evidence that the impartment of cross-curricular strategies should always be combined with the teaching of domain-specific strategies (Perels et al., 2005), we adopted the Latin translation process in conjunction with the self-regulated learning

process by subdividing the translation process into three different phases (analysis/decoding, transfer/recoding, and restructuring) (Nida & Taber, 1969).

Concerning the contents of our training programs, we were generally oriented toward theoretical assumptions of self-regulated learning and didactical knowledge of translation work in Latin instruction (Keip & Doepner, 2010; Glücklich, 2008). We assumed in our model (cf. Figure 1) that both theoretical considerations are interrelated and form together a powerful framework to optimize effects on self-regulated learning, translation competency as well as on the application of translation strategies.

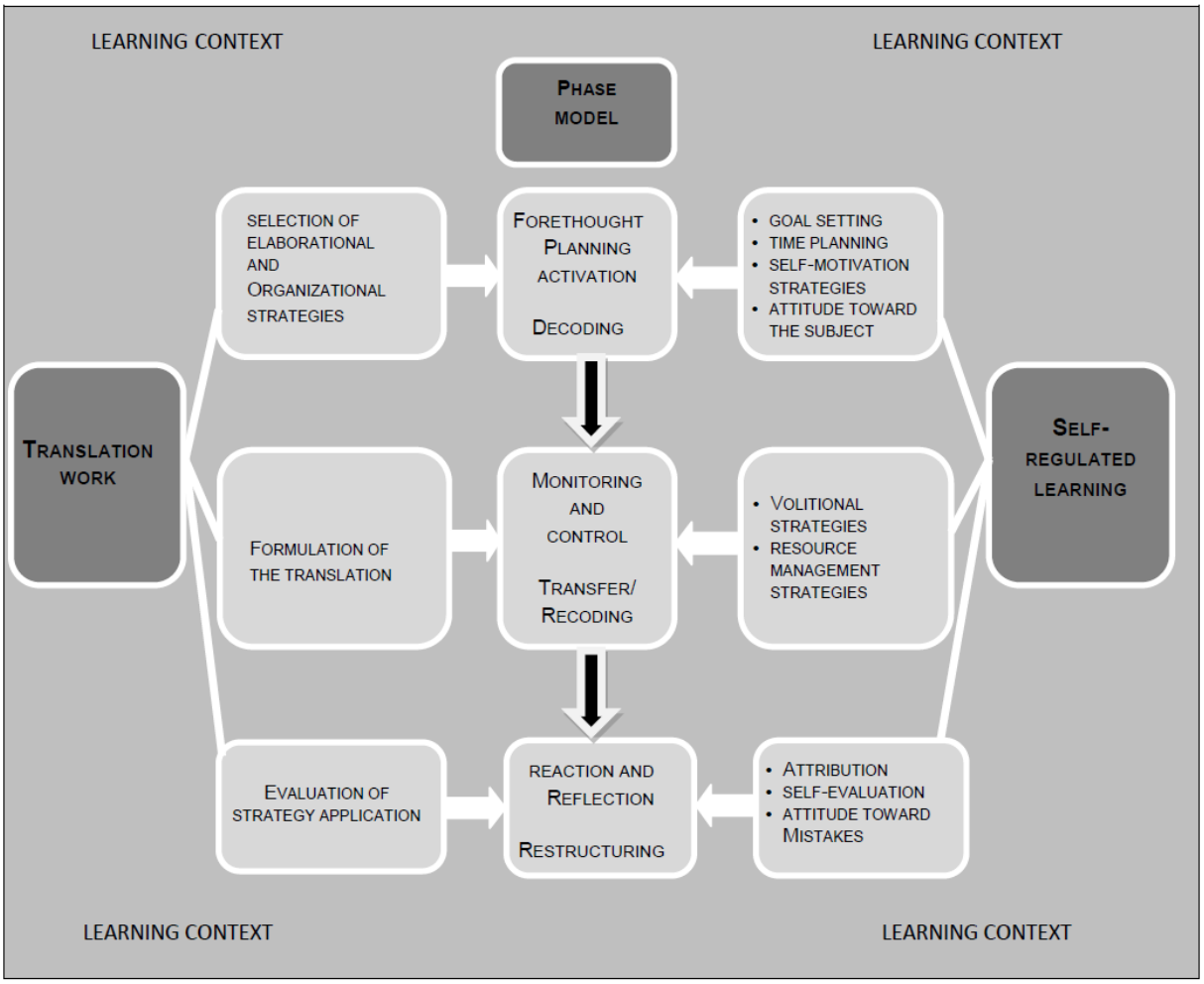

Figure 1. Model of self-regulated translation (adapted from Perels et al., 2004).

As there is little empirical evidence for a definite separation of monitoring and control processes (Pintrich, 2000), we considered both phases together in the model. Because of that arrangement, our model is similar to the cyclical model of self-regulated learning by

Zimmerman (2000), which depicted the learning process in three phases: forethought, performance, and self-reflection.

In the following section, we present the important strategies of the different phases of the self-regulation and translation process. The process of self-regulated learning starts with the *planning phase*, during which the setting of goals with regard to a task plays a decisive role. Activities that are important in this phase include the activation of prior knowledge (Pintrich, 2000) and raising awareness of motivationally advantageous goal orientations (Dweck, 1999) that are characterized by high self-efficacy beliefs (Bandura, 1997). Interest with regard to the task is also influential on the motivational orientation (Wigfield & Eccles, 1992). For the purpose of this study, the operationalization of interest involved the preference of Latin as a subject, and for activities that are related to Latin (e.g., translating Latin texts), and was regarded as a determinant that contributes to intrinsic motivation (Malone & Lepper, 1987; Ryan & Deci, 2000).

In addition, we laid great stress on self-motivation strategies, such as promising oneself extrinsic rewards (e.g., watching a favorite TV series, meeting friends), as they help to sustain students' motivation toward the task (Nota, Soresi & Zimmerman, 2004).

Planning one's behavior also belongs to essential aspects of the learning process. In this context, strategies for learners may involve time-management activities (e.g., setting up time schedules or reserving fixed time frames for homework; Pintrich, 2000; Claessens, van Eerde, Rutte, & Roe, 2007; Corno, 1986).

Moreover, the study environment (e.g., classroom, situation at home) requires specific self-regulatory strategies. In order to obtain a first overview of the situation before starting the actual learning process, the learners have to perceive the demands of the context (e.g., possible distractions, climatic circumstances).

In the special case of translation work in Latin instruction, some essential translation strategies for each phase were integrated into our program, whereby we were oriented toward

the model of translation by Nida and Taber (1969) that made a distinction between three phases of translating a text.

In the *phase of analysis/decoding*, we further differentiated between the selection of elaborational and organizational strategies, which should be used in order to prepare the text for the actual translation. Elaborational strategies refer to activities such as thinking about the headline or making use of introductory words, making notes while reading a text or creating mental images (Weinstein & Mayer, 1986). With regard to translation work, the consideration of the semantic functions is particularly important as semantics covers the students' meaning and interpretation of words and sentences. By asking oneself questions and formulating content-related expectations (Keip & Doepner, 2010; Glücklich, 2008), the learner develops a first understanding of the basic messages of the text.

Organizational strategies, however, are targeted toward outlining and structuring of a text (Weinstein & Mayer, 1986) and help to organize the information in the first reading. Furthermore, these strategies include clarifying of unknown vocabulary and analyzing the grammatical elements and syntactic functions by following the grammatical-syntactical approach (Keip & Doepner, 2010; Nida & Taber, 1969). The central idea of that approach is the analysis and the underlining of constituents that sentences are composed of, and of the specific grammatical function they serve.

During the *monitoring and control phase*, the selection and adaptation of strategies for managing volitional factors are important. In our trainings, we emphasized the employment of volitional control strategies (Corno, 2004), as they help learners to stay focused on the task and their goals even if negative emotions (e.g., anxiety or disappointment) or distractions in the environment threaten to impact learning negatively (Boekaerts & Niemivirta, 2000), or favor procrastinating the performance of a task (Wolters, 2003). Besides, resource management strategies can be applied when confronted with changing conditions or encountering unforeseen problems. Learners have to observe and flexibly regulate their effort

and time, and they have to study the environment when something does not unfold as planned.

In the *phase of transfer/recoding* the learners document their understanding of the text by transposing the text's content into the target language. As Latin sentences are mostly of high complexity and structurally unusual, it is challenging for people today to transfer the meaning of the original text into the target language successfully and to formulate a logical and understandable translation. That is why it is very important to have a well-decoded text as foundation for the transfer and recoding.

After task completion, in the *phase of reflection and reaction*, learners try to understand the reasons for success or failure and reflect the outcome of their performance by attributing it to either ability, luck, or effort. Accordingly, attributing success to internally stable factors, such as one's abilities, and failure to an external, uncontrollable factor, such as luck, is most beneficial for self-esteem and motivation (Weiner, 1986).

In this context, it is important to adopt a positive attitude toward making mistakes in such a way that accepting mistakes becomes part of the learning process and is viewed as an opportunity to learn (Brooks & Goldstein, 2004). Eventually, the comparison of the final goal attainment with the original goals and the self-evaluation of personal progress might lead to new beliefs that influence future goal settings and task processing.

After having completed the translation, the learners have to evaluate their strategy application by reviewing the wording, by correcting, and if necessary restructuring the word order to conform to norms of the target language.

The general aim of our training programs was to take the overall process of self-regulated translating into consideration by enhancing several components of each phase of self-regulated learning and translation work. Choosing this approach, we expected to be able to analyze students' self-regulated behavior in a more differentiated manner.

5.2.1. Assessing self-regulated learning

As far as the measurement of self-regulated learning is concerned, previous studies have demonstrated that it can be assessed either as an aptitude, referring to a person's stable attributes that predicts prospective behavior, or as an event that allows more complex and procedural analyses along a timeline (Pintrich, Smith, Garcia, & McKeachie, 1991; Winne & Perry, 2000). There are questionnaires which are approved and often used, such as the Learning and Study Strategies Inventory (LASSI) (Weinstein, Schulte, & Palmer, 1987), the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991), and the Inventory for Recording Learning Strategies in Academic Studies (LIST) (Wild & Schiefele, 1994), which is based on the previously named instruments. This way of measuring is confined to self-report data that, on the one hand, leads to a generalization of actions rather than to a description of the immediate experience of the situation, and on the other hand, is easy to be gathered and scored (Winne & Perry, 2000). Regarding the measurement of self-regulated learning as a process, methods such as think-aloud techniques, direct observations, and standardized learning diaries were developed in order to assess self-regulatory strategies more continuously with regard to enhancing self-regulatory and reflective behavior. In our study, we focused on a questionnaire as a method to assess self-regulated learning, employing frequently used items to provide data on how students plan, monitor, control, and reflect their cognition, motivation, and behavior in their learning environment (Boekaerts & Corno, 2005). The questionnaire was supplemented by a standardized translation test that collected data on students' translation competency as well as on their application of translation strategies.

5.2.2. Fostering self-regulated learning

Earlier studies on intervention programs for fostering self-regulated learning have reported how training results in the enhancement of self-regulatory abilities and academic achievement (Dignath, Buettner & Langfeldt, 2008; Fuchs et al., 2003). Perels, Dignath and

Schmitz (2009) demonstrated the effectiveness of self-regulation training in regular math classes. In addition, the findings of a large body of research studies have revealed that trainings which combine the teaching of self-regulatory strategies with domain-specific strategies are more efficient than trainings that focus on strategies in isolation (Kramarski & Gutman, 2006; Perels et al., 2005). Most of these studies operate in the fields of mathematics (Cleary & Chen, 2009; Kramarski & Gutman, 2006; Perels, Dignath, et al., 2009), reading (Leutner, Barthel & Schreiber, 2001; Souvignier & Mokhlesgerami, 2006), writing (Graham & Harris, 2000) or Web-based learning environment (Shen, Lee, & Tsai, 2007). Studies on self-regulation in foreign language learning, however, are underutilized and are mostly restricted to English as a foreign language (EFL) (Chularut & DeBacker, 2004) or cover special fields such as vocabulary acquisition (Tseng, Dörnyei, & Schmitt, 2006) or language learning strategy use (Yang, 1999).

Generally, we found no studies discussing the effects of self-regulated learning and translation work in foreign language teaching. Moreover, there has not been any research on the simultaneous promotion of self-regulated learning and translation competency in Latin instruction, which was the aim of the present study. For this purpose, we designed two training programs which consisted of components of self-regulated learning and Latin translation. Specifically, our research interest focused on examining the effectiveness of these programs on enhancing students' self-regulatory abilities as well as on their translation competency and translation strategy application and to analyze changes that occurred between a pre- and a posttest. Additionally, we wanted to test whether a combined training of self-regulatory and translation components would lead to better results than just teaching one of these components. Our major hypothesis of the study was that each of the programs would have a positive impact on students' self-regulated learning, translation competency and strategy application and that the training groups would outperform a control group that was not involved in the training. We specifically expected that the combination group (ComG)

would outperform the pure translation group (TG) as well as the control group (CG) in the questionnaire concerning self-regulatory competencies as well as in the translation test concerning both the overall translation competence and the strategy application. In case that the implementation of the programs led to improved learning skills, students would be provided with the opportunity to practice and internalize the acquired competencies. Our assumption was that the data of the variables would not change significantly between the posttest and a stability measurement (follow-up-test), so that no additional effect eight weeks after the intervention would occur. Nevertheless, it was expected that the participants of the intervention would have higher levels in terms of the dependent measures and that the ComG would still show the highest gains on the dependent measures.

5.3 Method

5.3.1. Participants and design

The study was conducted in six German grammar schools, and participation was voluntary. The overall study was quasi-experimental and a pretest-posttest control group design was used in order to analyze the effectiveness of the treatment. Long-term effects were examined with a retention test eight weeks after the posttest. In general, we differentiated between three groups: a combined training group (ComG), which was trained in self-regulated learning and Latin translation strategies; a group that was only trained in Latin translation (TG); and a control group without training (CG). A group that received only self-regulated strategy training could not be incorporated into the design due to actualities of the schools' situation.

The combined group consisted of 41 students, the translation group consisted of 32, and the control group consisted of 36 students. Altogether, 109 students of the tenth grade took part in the study. The mean age of participants was 15.72 (*SD* = 0.56), and 53.2% of participants were female.

5.3.2. Procedure

For the pretest, self-regulated learning abilities, the application of Latin translation strategies, and the quality of the Latin translation that was prepared was rated by means of a self-regulation questionnaire and a standardized translation test one week before the intervention. The same questionnaire and a comparable test were utilized one week (posttest) after the intervention. During the period between pre- and posttest (3 weeks), the training program for the experimental group (i.e., training groups) was conducted, which consisted of three 45 minutes sessions in the regular lesson on a weekly basis. After a period of eight weeks, the participants of the training groups got the same questionnaire again as well as another test comparable to the posttest regarding difficulty and length, in order to measure the stability of the training effects.

The control group underwent only the pre- and post-testing because the drop-out rate of students was too high in the follow-up testing. Between the two points of measurement, the CG did not get any special intervention but was instructed by their regular teacher in learning strategies for dealing with complex texts in Latin. Concerning the learning contents and the time setting, a parallel instruction of both the control and the training groups could be guaranteed to the greatest possible extent. It was important that the control group would deal with texts in prose form rather than with lyric texts as the training programs entirely concentrated on prose that requires a different approach than poetry.

The training of the intervention groups started shortly after the pretest and was conducted by two specialized trainers, who also took charge of testing.

5.3.3. Intervention

In order to depict the intervention program, we primarily focus on the combined training program which included both self-regulatory and translation components. Variations of the full training program (ComG) included that the aspects of self-regulated learning were

left out in the TG and instead more emphasis was placed on the translation process. According to the school's circumstances, it was not possible that the ComG dealt 45 min with self-regulated learning and got additional 45 min for translation work which would have guaranteed absolute parallelism of instruction.

Over the course of nine lessons, the students of the ComG had to work on different exercises, including aspects of their learning in general (15 min) as well as domain-specific tasks that specifically trained them to deal with Latin texts (30 min). The domain-specific tasks were based on the curriculum for the tenth grade. In general, we tried to utilize methods and arrangements of interactive learning in order to promote self-regulated learning.

We integrated general learning strategies that are typical for the particular phases of self-regulated learning (e.g., goal setting, time planning, self-motivation strategies, attitude toward a subject, volitional strategies, resource management strategies, attribution, attitude toward mistakes, and self-evaluation) and domain-specific translation strategies for each phase of the translation process. In the TG, we concentrated on instructing translation strategies (organizational and elaborational strategies, formulation of the translation, rewording, restructuring) for dealing with complex Latin texts. The CG did not receive special training, but learned about translation strategies in regular class to maintain a reasonable equality of instruction.

The sessions' arrangement in each week followed the contents of the different phases of self-regulated learning. In the second week, for example, we focused on volitional strategies and on the formulation of the translation (cf. Fig 1). Table 2 gives a particular overview of the contents.

The instructors always started with a repetition of the preceding lesson and the discussion of the students' homework. Afterwards, one self-regulatory and one domain-specific strategy were covered. The lesson ended with a short review and homework assignments. The first three sessions served to gather students' expectations and to inquire

about their attitude toward Latin as a subject. Furthermore, the students were made familiar with self-regulatory strategies that are important in the planning phase of the learning process (realistic goal-setting, effective time planning, self-motivation) and with helpful decoding strategies (e.g., questioning, marking, structuring). In order to gain a first impression of the topic the Latin texts were dealing with, the students reciprocally read the first text in pairs, and after each passage, they explained their partner what they had understood so far and how the text probably will continue. By this, previous knowledge was activated and a first understanding was established.

In the next sessions that were oriented toward the monitoring/control and the transfer/recoding phases, students started translating the text by benefitting from their previous decoding. In terms of self-regulated learning, strategies such as prohibiting procrastination, techniques including dealing with distractions (both internal and external), rewording disturbing thoughts, concentration, and relaxation were introduced. In addition, students were always encouraged to discuss their personal experiences and to consult each other. The last week sessions covered strategies such as handling mistakes or possibilities of favorable causal attribution. Regarding the domain-specific contents, the students evaluated their strategy application and examined their translated text in terms of correctness and logic in the target language. In case of logical flaws, they learned how to restructure and reword the text. Moreover, they analyzed typical mistakes they make when translating and deepened the application of translation strategies by putting jigsaw pieces of a text in the correct order. By this, they were supposed to get an additional understanding of logic and structure of Latin texts. In the last session, we compared the students' initial expectations and goals with their final impression of the training.

Table 2

Topics of the Intervention Program

Learning contents of the training groups exemplarily for the ComG		
Session	Self-regulative content	Translation content
1st & 2nd session	Introduction of self-regulative strategies	
	Expectations	
	Attitude toward Latin	
3rd session	Goal-setting	Introduction to the topic
	Time planning	Organizational and elaborational strategies
4th session	Self-motivation	Organizational and elaborational strategies
5th session	Procrastination	Formulation of the translation
	Dealing with internal and external distractions	Formulation of the translation
6th & 7th session	Concentration	Formulation of the translation
	Relaxation	Formulation of the translation
	Raising the awareness of how to translate strategically	
8th session	Handling mistakes	Evaluation of strategy application, restructuring
	Attribution	Text jigsaw puzzle
9th session	Comparison of initial goal with final impression	Typical mistakes

5.3.4. Instruments

Self-regulation questionnaire. A standardized self-regulation questionnaire was used to measure the students' self-regulated learning. The responses were rated on a scale with scores ranging from 1 to 4 (1 = *definitely not true*; 2 = *tends not to be true*; 3 = *tends to be true*; 4 = *definitely true*). Altogether, the questionnaire consisted of 71 items that were summed up to create four scales (planning, monitoring/control, and reflection) representing the different phases of the framework for self-regulated learning by Pintrich (2000). In this study, these scales were aggregated into an overall scale *self-regulated learning*. The reliabilities (Cronbach's α) of all scales proved to be very reliable (cf. Table 3) both in the pre-, post-, and follow-up test. The validity of the questionnaire was ascertained by using items from established instruments (Perels et al., 2005, Pintrich et al., 1991, Ryan & Connell, 1989),

whereas some items were newly developed, if necessary. The standardized completion of the questionnaire was guaranteed by investigators that gave the necessary instructions during regular classes.

Table 3

Summary of Reliability Estimates

Scales	Items	Reliability (Cronbach's α)	Example
OVERALL/Scales **Self-regulated learning**	**71**	**t_1 .87 t_2 .88 t_3 .88**	
Planning	25	t_1 .85 t_2 .89 t_3 .86	I make good use of my study time in Latin instruction.
Monitoring & Control	30	t_1.92 t_2.94 t_3 .93	When I study, I find my mind wandering to other things.
Reflection	16	t_1 .79 t_2 .85 t_3 .84	After studying, I think about what to improve.

Note. t_1 = pretest/ t_2 = posttest/ t_3 = follow-up-test.

Translation test. In order to measure the translation competency and the application of translation strategies, students were provided with an experimenter-designed translation test which was criterion-referenced. The translation competencies were measured by the quality of the final translation that was prepared. The assessment of the application of translation strategies referred to initial preparations of the text as well as to the final evaluation of strategy use. At each point of measurement different texts were used that all had a parallel structure as well as the same amount of difficulties (e.g., grammatical constructions). The texts were kept in prose form and were oriented toward Cicero's rhetorical work *De oratore* (text passage$_{pretest}$ 2, 217-290; text passage$_{posttest}$ 2, 18, 75; text passage$_{follow\text{-}up\text{-}test}$ was not based on an original text, but was completely self-formulated). The texts were invariably designed in conjunction with experts in order to ensure content validity. The degree of difficulty of the texts was quite high (Pt1 = .15; Pt2 =.22; Pt3 =.14), which was necessary, as the students had

to be challenged to decode the text strategically rather than merely translate it word-by-word which would interfere with the attempt to realize the understanding of the text as coherent as possible (Mokhlesgerami, Souvignier, Rühl, & Gold, 2007). The text was subdivided in four parts, in which the students could reach a maximum number of 15 points for the overall translation competency and 9 points for the application of translation strategies. For the analysis of both the quality of the translation (translation competency) and the application of strategies, raters used a schema and were blind to each others' scores. Interrater-reliability was within adequate limits (Cohen's κ was 0.81 for the pretest, 0.83 for the posttest, and 0.85 for the follow-up-test). In order to meet the convergent criterion-related validity, the students' pre- and posttest translation achievement scores were correlated with the Latin marks of a recent classroom exam (Time 1: $\rho_{cc} = -.40$, $p < .01$; Time 2: $\rho_{cc} = -.28$, $p < .05$) and with the last report marks (Time 1: $\rho_{cc} = -.40$, $p < .01$; Time 2: $\rho_{cc} = -.38$, $p < .05$)[5].

5.4 Results

The primary purpose of our study was to investigate the effectiveness of different intervention programs with regard to the enhancement of self-regulatory abilities as well as of translation competency and translation strategy application. The hypotheses postulated that training leads to an improvement of self-regulated learning as well as of achievement variables whereas the control group is stable. Specifically, we assumed that the self-regulated learning abilities as well as the translation competence and the translation strategy application of the ComG would increase the most.

The dependent measures were analyzed using a 3 (pretest/posttest/follow-up-test) x 3 (training conditions) analysis of variance with time as repeated measurement factor. As randomization to the different conditions was not possible, the pretest differences were controlled first. In case of pretest differences, analyses of covariance were conducted to control these differences.

[5] The variables move in opposite directions. The lower the grades the better the performance. That is why the correlation turned out to be negative.

In terms of pairwise comparisons of the contrasts between the two intervention groups and the control group as well as between the combined group and the translation-only group, the difference between the values before and after the intervention was taken into consideration. For all analyses we selected a 0.05 level of significance.

Table 4 presents the mean scores and standard deviations of the dependent measures (DV) as well as the results of interaction time x training.

Table 4

Means, Standard Deviations and Results of the Analysis of Variance with Time as a Repeated Measurement

Questionnaire						
DV	**Group**	**Pretest** ***M* (*SD*)**	**Posttest** ***M* (*SD*)**	**df**	**F**	η^2
Overall self-regulated learning (Range 1-4)	TG	2.53 (0.35)	2.50 (0.38)	106	4.26*	0.07
	ComG	2.37 (0.43)	2.49 (0.45)			
	CG	2.53 (0.42)	2.45 (0.49)			
Translation test						
Overall translation competence[1]	TG	3.53 (3.58)	5.69 (3.48)	105	33.74***	0.39
	ComG	1.55 (1.94)	2.32 (1.84)			
	CG	1.56 (2.08)	0.65 (0.99)			
Translation strategy application[1]	TG	1.58 (2.20)	3.73 (2.75)	105	21.77***	0.30
	ComG	0.63 (0.88)	1.59 (1.64)			
	CG	0.64 (0.75)	0.40 (0.72)			

Note. Dependend variable (DV), # $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; TG = translation training only group (N = 32), ComG = combined group (N = 41), CG = control group (N = 36).
[1] Because of pretest differences ANCOVA with pretest values as covariate was conducted.

The results of an analysis of variance with time as repeated measurement demonstrated a significant interaction between time x training for the overall scale self-regulated learning (cf. Table 4).

Figure 2 additionally illustrates the results of the overall scale self-regulated learning. The participants of the ComG could improve their self-regulatory competencies, whereas both the TG and CG decreased slightly.

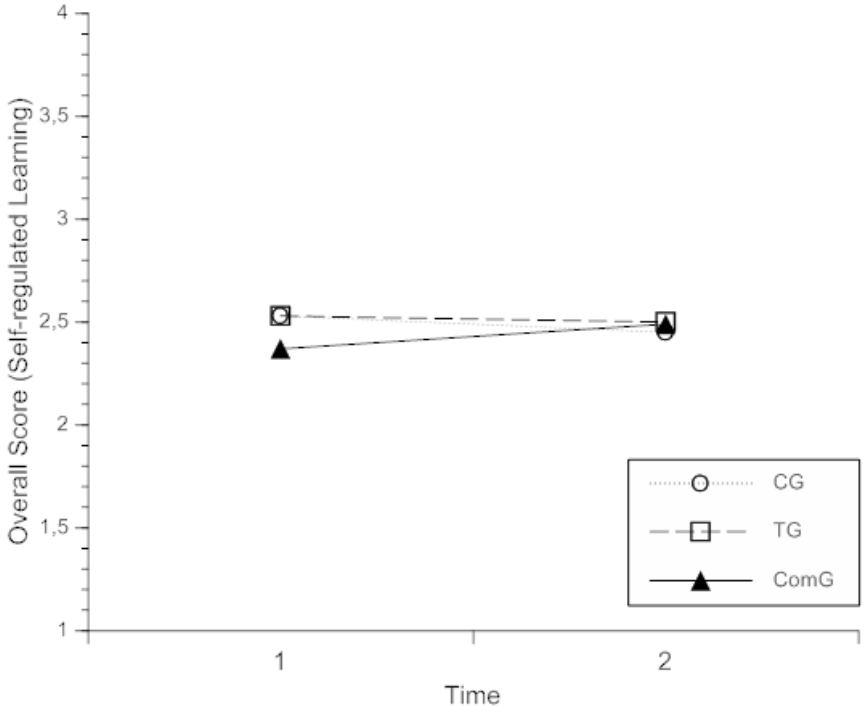

Figure 2. Results of the overall scale self-regulated learning.

Contrast analyses were conducted for the overall scale self-regulated learning. The hypotheses postulated that the ComG and the TG experienced improved self-regulatory abilities compared to the control group (contrast 1). Moreover, it was expected that the ComG increased the most compared to the TG (contrast 2). Table 5 depicts the contrast coefficients for the analyses.

Table 5

Orthogonal Coefficients for Contrast Analyses

	Group		
Contrast	ComG	TG	CG
1	1	1	-2
2	1	-1	0

The analysis of the overall scale self-regulated learning revealed a significant first contrast. This result shows that the training groups (ComG and TG) showed significant higher

self-regulatory abilities compared to the control group (cf. Table 6), with the ComG generally showing an improvement and the TG a decline of self-regulatory abilities.

In terms of the second contrast, we obtained a significant result at the 10%-level which indicated only a marginal effect. Thus, the students of the ComG slightly improved their self-regulatory competencies in comparison to the TG.

Table 6

Results of a Priori Defined Contrasts

	Contrast	**Contrast value (*SD*)**	**df**	**t**	**r**
Overall self-regulated learning	1	0.26 (0.13)	106	2.02*	0.19
	2	-0.15 (0.08)	106	-1.95#	0.19
Translation competency	1	4.74 (1.20)	105	3.96***	0.36
	2	1.40 (0.70)	105	2.01*	0.19
Translation strategy application	1	3.59 (0.74)	105	4.88***	0.43
	2	1.19 (0.43)	105	2.78**	0.26

Note. # $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; r = effect size

Concerning the overall achievement variable (translation competency, sum over all demands of the test, max. score: 15), we found significant pretest differences between the groups, $F(2, 105) = 6.58$, $p = .00$. Therefore, an analysis of covariance (ANCOVA) had to be conducted. After adjusting for pretest scores, our result for the posttest scores indicated a significant training effect for the translation competency (cf. Table 6).

Figure 3 depicts the results of the subscale translation competency. It shows an increase among the participants of ComG and TG but a decline in the CG.

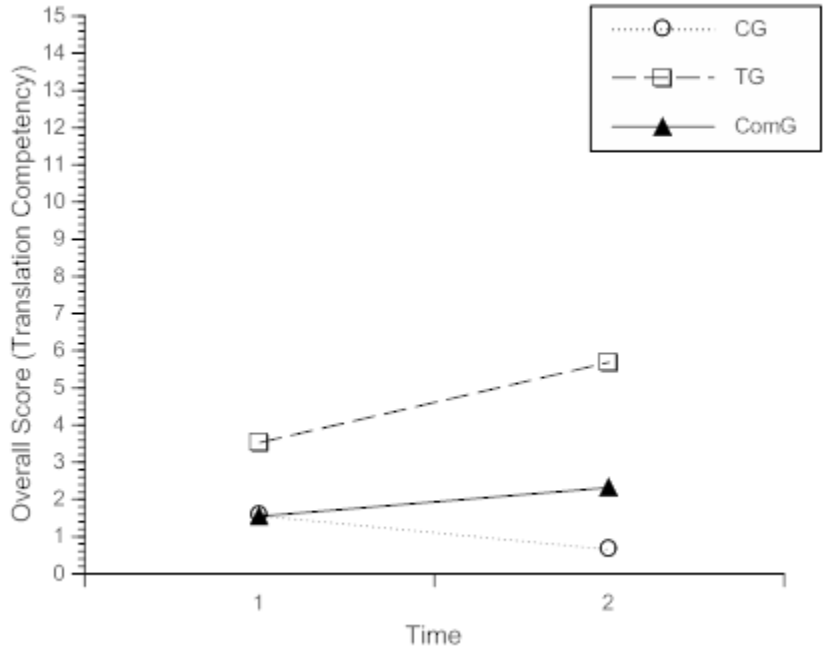

Figure 3. Results of the translation competency.

For the translation competency, we also conducted contrast analyses with the difference between the pretest and the posttest. The analyses revealed that both the first and second contrast were significant (cf. Table 6). Consequently, on the one hand ComG and TG increased their translation competency significantly compared to the control group (contrast 1) and on the other hand the TG showed a higher improvement with regard to the translation competency in comparison to the ComG.

Taking the actual application of translation strategies into consideration, we found significant pretest differences between the groups, $F(2, 106) = 9.59$, $p < .001$. Therefore, results were conducted with an analysis of covariance (ANCOVA) with pretest scores as covariate. As can be seen in Table 4, the ANCOVA displayed a significant training effect for students' strategy application.

Figure 4 shows the results of the application of translation strategies. There was an increase in both the ComG and TG. In contrast, there was a decline in the CG.

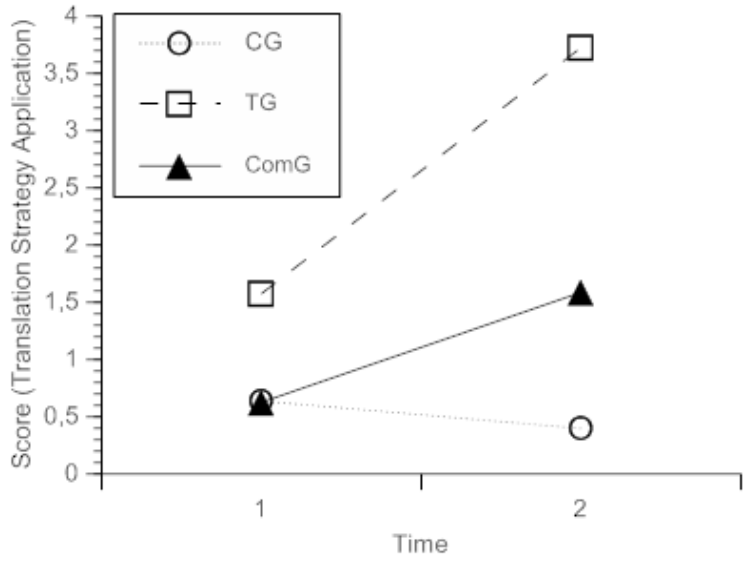

Figure 4. Results of the application of translation strategies.

The running of contrast analyses revealed two significant contrasts: Both intervention groups increased their translation strategy application compared with the control group, and the translation-only group showed a larger increase than the combined group.

The same questionnaire and a further translation test were used eight weeks after the intervention in order to measure the stability of training effects. Because of a high drop-out rate, the stability measurement for the control group could not be performed. No additional effects were expected, but data should not reveal a decrease either.

Table 7

Results of the T-Tests for Stability Measurement

DV	Group	Posttest *M (SD)*	Stability *M (SD)*	df	t	*p*	d
Questionnaire							
Overall self-regulated learning (Range 1-4)	TG	2.51 (0.39)	2.46 (0.40)	29	1.09	0.28	0.19
	ComG	2.54 (0.43)	2.49 (0.42)	32	0.93	0.36	0.17
Translation Test							
Overall translation competence	TG	5.69 (3.48)	2.56 (3.53)	30	3.88	0.00	0.70
	ComG	2.15 (1.79)	2.46 (2.18)	30	-0.99	0.33	0.11
Translation strategy application	TG	3.73 (2.75)	1.54 (2.07)	30	4.36	0.00	0.79
	ComG	1.42 (1.56)	1.52 (1.64)	30	-0.34	0.74	0.18

Note. TG = translation training only group (N = 32), ComG = combined group (N = 41).
− = increase, + decrease; d = effect size.

In general, the results of the t-tests for stability measurement (cf. Table 7) show that there was no significant change for the variables between posttest and follow-up-test except for the achievement variables in the training group TG. As expected, no additional effect occurred after the intervention over a period of eight weeks. The students' self-regulatory competencies remained very stable in both groups, though they showed a slight but insignificant decrease. This implies that the intervention had only an effect during the actual training period.

The translation competency as well as the translation strategy application of the combined group was stable after the intervention and revealed an insignificant increase, whereas a significant decrease in both variables was observed for the translation-only group. This result implies that participants of the TG had a lower level of translation competency and strategy application skills after a period of eight weeks.

5.5 Discussion

The purpose of the study was to investigate the effectiveness of two training programs in terms of self-regulated learning abilities and translation competencies of tenth grade students within their regular Latin class. Thereby, self-regulated learning was measured by students' general and Latin-related self-regulatory competencies. Students' academic achievement was measured by the quality of their translation and by the application of translation strategies. The intervention's effectiveness was examined by analyzing three different groups: a group that was taught both self-regulatory and translation strategies (ComG); a group that was only taught translation strategies (TG); and a group that did not receive any training, but was instructed by the regular teacher (CG).

The results of the pretest-posttest evaluation indicate that it is possible to enhance self-regulatory and translation competencies by an intervention program within regular Latin classes of tenth grade students in comparison to a control group without any special training. This was the finding we anticipated. The second hypothesis that postulated a predominance of the ComG in comparison to the TG could be unambiguously confirmed for no variable. For their self-regulatory competencies, students of the ComG showed an increase, though significant only at the 10% level, compared to the students of the TG. Therefore, this result merely points in the direction that the additional teaching of self-regulated learning components predominates the teaching of translation strategies in terms of self-regulated learning skills. Accordingly, it can be regarded as a vague confirmation of findings of other studies (Kramarski & Gutman, 2006; Perels et al., 2005) which showed that the combination of self-regulatory and problem-solving strategies in mathematics leads to the best effects for the improvement of self-regulatory competencies.

The lacking predominance of the ComG in terms of self-regulatory behavior can be explained by the fact that the students might have been overwhelmed by self-regulatory components in Latin class. Students were, by their own account, used to the close guidance of

their teachers, so that self-regulated learning and translating required a lot of effort and flexibility from the students.

In terms of academic achievement, our findings indicated that it is possible to promote translation competencies as well as strategy application by training as both ComG and TG showed a higher improvement than CG that even revealed a decline in both variables. Nevertheless, against our expectations, students of TG rather than students of ComG showed the highest increase in their translation competency as well as their strategy application, even though the ComG still reported an increase. The fact that the combined group did not profit more compared to the translation only group, is neither in accordance with our assumptions nor with the results of other studies (Kramarski & Gutman, 2006; Perels et al., 2005). This result can be explained by different reasons: As the TG got 15 minutes more translation training per session than the ComG, the students of the TG got more exercise in terms of translation work, which surely is a limitation of the present study but is due to the fact that a deviation from the regular timetable was not possible. Future studies should therefore try to extend the ComG's session to 90-minutes training sessions in order to intensify the combination character of self-regulatory and domain-specific components.

A further explanation for the lacking predominance of the ComG with regard to the translation competency and strategy application might be the mathematantic effect (Clark, 1990) which occurs in case that innovative treatments disrupt the learners' usual routine. In our case the students' accustomed approach to Latin texts might interfere with the development of self-regulatory abilities. Taking in consideration that a self-regulated strategic approach to Latin texts takes a long time as Latin has a different structure from the German language and is highly inflected, this result can be regarded from a different perspective and is found to be in line with research on strategic reading which was demonstrably revealed to be a long-term process (Guthrie et al., 1998). In comparison to the ComG that had to engage themselves into two different kinds of unfamiliar strategies (self-regulatory and translation

strategies) and to transfer them into daily routine, the TG only had to concentrate on a new translation approach.

To sum up, the results of the overall scale self-regulated learning supported the assumption that a training program is effective to improve students' self-regulated learning behavior and academic achievement in comparison to a control group that proceeded with the regular lessons. The fact that the combined training program did not reveal the expected effects in comparison to the translation group can be considered to be a matter of domain. As the predominance of combined training programs was primarily found in mathematics (Kramarski & Gutman, 2006; Perels et al., 2005), it could be of interest to analyze this result also for the teaching of foreign languages.

Concerning the measurement of stability of intervention effects, we wanted to show that the effects were stable, that no additional effects can be found and that there is no decrease for any variable. Taking in consideration that we had the drop-out of the control group, our hypotheses could be approved with one exception. The students of the TG showed a decrease of both achievement variables. This result might be due to the Latin proficiency certificate that the students of the TG had to prepare in the period between posttest and stability measurement. The preparation for this important exam let them fall back on their usual strategy application and translation habits as they had to meet the strict requirements that the examination board as well as their teachers determined. That is why the change from the self-regulated approach practiced in the training to the regular instruction was more extreme for the TG than for the ComG. Nonetheless, it is remarkable that we could reveal stability of intervention effects after a longer period of time for the ComG in terms of self-regulatory competencies as well as of achievement variables. This result is an indication for the sustainability of the training of self-regulatory strategies in combination with domain-specific strategies.

The study's findings should not give ground for pessimism as it was the first empirical study that examined self-regulated learning and translation work in Latin class simultaneously. A change of habitual concepts and the establishment of a new strategy use need time. Against the background of this, the present study was a first step to raising the students' awareness for the importance of promoting cross-curricular competencies in that domain.

Nonetheless, there are limitations to this study that can be clearly specified. The prerequisites of a complete intervention design could not be met as the recruitment of a group that would have been taught self-regulatory strategies only was not possible. As teachers have to stick to the subject matter, it was not possible to find a teacher who was willing to neglect the curriculum's learning goals in favor of the impartment of cross-curricular competencies over a period of three weeks. Moreover, due to actualities of the school's situation, the participants could not be randomly assigned to the groups, which lead to an increase of external validity. This however, was balanced by controlling for pretest differences.

A further limitation that has to be pointed out concerns the duration of the training program. Since our training program was designed as a first part of a larger intervention study, we confined ourselves to three weeks in order to be able to expand our procedure in the near future. Had the intervention been longer than three weeks, larger transfer effects of the training program may have been revealed, especially in terms of the internalization and automatization of strategy use (Pressley, Snyder, & Cariglia-Bull, 1987). As other studies found that the effect sizes of intervention programs increased with the number of training sessions (Dignath & Buettner, 2008), we suggest longer interventions that would make an intensive and sustainable training possible, even though Hattie, Biggs and Purdie (1996) have shown that longer interventions have to be regarded against the background of a curvilinear trend between promotion and assessment of performance.

Another limitation refers to the measurement of the variables, because they are – except for the translation test – based on students' self-report data and may not be absolutely effective in accurately representing the constructs of interest. Self-report questionnaires are generally restricted in measuring self-regulated learning processes because conclusions regarding how far the students can actually regulate their learning are not possible (Spörer & Brunstein, 2006). However, they are directional for the assessment of a general aptitude to how one uses different self-regulatory processes (Pintrich, 2003). For future research, we suggest considering additional measures, such as keeping learning diaries, interviewing, and making observation since these techniques could validate the results based on students' perceptions.

The present study implies practical consequences for prospective interventions providing that the design of the study is extended by a teacher training in which the instruction of self-regulated learning strategies is taught to and discussed with teachers. As findings of Waeytens, Lens, & Vandenberghe (2002) showed, teachers often are not aware of the concept of self-regulated learning and should therefore not only be provided by teaching material but also involved within the intervention of the study. This will have contributing effects on both the teachers' (Cardelle-Elawar, Irwin, & Sanz de Acedo Lizarraga, 2007) as well as on the students' self-regulatory behavior (Kremer-Hayon & Tillema, 1999), and will generally help to improve the teachers' understanding of their students' needs and their sense of imparting learning strategies (Paris & Winograd, 2001).

The concept of our study definitely adds to research as it established a good foundation for a transfer of self-regulatory strategies to translation tasks in Latin instruction and supported the implementation of self-regulated learning in regular class settings. Hence, an integration of self-regulatory strategies into regular Latin class should be initiated to positively influence both the development of self-regulatory learning behavior and translation

competency so that a strategic approach to Latin texts can also be promoted in an earlier state of the students' school career.

6. Study 2 – Enhancing self-regulated learning and Latin translation competency using the learning platform Moodle

6.1 Abstract

The study's aim was to develop an intervention program and to evaluate its contribution to students' self-regulated learning and Latin translation achievement. The program was carried out via the learning management system *Moodle*. In a direct training (DT) approach, the *students* themselves acquired the training strategies directly, whereas in the indirect training (IT), the *teachers* were enabled to impart these strategies to their students. In order to investigate the effectiveness of the intervention regarding SRL skills and translation competency (accuracy, self-reported, and actual strategy use), a 2 × 2 × 2 factorial design with the factors DT (+ /-), IT (+ /-), and time (pre-/ posttest) was realized with 274 lower secondary students. From this, four groups resulted: a single DT ($DT^{+}IT^{-}$), a single IT ($DT^{-}IT^{+}$), a combination ($DT^{+}IT^{+}$), and a control condition ($DT^{-}IT^{-}$). The intervention's effectiveness in terms of the enhancement of SRL and translation strategy skills was revealed because all training groups differed significantly from the control condition. Specifically, the single DT showed the highest learning gains for all variables. However, when combining the two training approaches, no synergetic effect arose, which could be an indicator for reciprocal interferences.

Keywords: self-regulated learning, translation competency, Moodle, repeated measures (M)ANCOVA

6.2 Introduction

In the last few decades, advanced technologies have progressively entered everyday life and have not spared the teaching and learning process. The Internet, computer work, or the implementation of learning management systems (LMS) has posed new opportunities, but also new challenges, to the school system.

On the one hand, information can be efficiently processed at any time and place, and learners are more flexible in the management of their learning. On the other hand, the omnipresent availability and complexity of information require the acquisition of new abilities in order to achieve the level of skills that is necessary to process information nowadays.

Students today are quite familiar with internet-based tools, but are not used to employ them for learning purposes (Azevedo, 2005). The use of LMS, however, challenges students to deal with open learning scenarios and to adopt more self-regulatory learning behaviors, which has turned out to be difficult for students (Graesser, McNamara, & VanLehn, 2005).
Self-regulated learning (SRL) is defined as an "active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000, p. 453).

Teachers should take into consideration that students might need support to develop this ability when they are confronted with complex and open learning situations.
Although results of constantly expanding research on SRL have revealed its relationship with academic achievement (e.g., Nota et al., 2004), teachers seem to lack knowledge and have little confidence in how to enhance SRL (Dignath-van Ewijk & van der Werf, 2012) and how to adequately realize an implementation in the classroom (Van Hout-Wolters, Simons, & Volet, 2002).

The present study adopted an innovative approach to introduce a new way of integrating SRL into classroom instruction by employing the online learning platform Moodle as a medium of intervention for promoting students' self-regulatory abilities and translation competency. In terms of its conceptual development, the present study formed a close connection to previous intervention studies that dealt with the support of SRL (Fuchs et al., 2003). However, the realization and implementation of the training program was novel and applied to the largely uninvestigated, domain-specific field of Latin translation because previous studies showed that the impartment of cross-curricular strategies should always be combined with the teaching of domain-specific strategies (e.g., Perels et al., 2005).

At this point, the question arises as to why Latin was our domain of choice when Haag and Stern (2003) disenchanted its myth, doubting its usefulness at least for studying other modern languages. The answer is that we were driven by our interest in how far even so-called "dead languages" leave considerable scope for integrating the support of SRL, and in how far the application of new technologies can be realized in context of Latin translation. Furthermore, dealing with complex Latin texts can be regarded as linguistic problem-solving (Sharoff, 2006) because the unusual structure of original Latin sentences can challenge today's young people to successfully formulate an understandable text in their target language. That is why we wanted to establish a common ground from which the students will be equipped with strategies that support the analysis and comprehension of complex sentence structures.

The purposes of this paper are (a) to present an approach to promoting SRL and Latin translation achievement with an LMS and (b) to demonstrate how such an approach can be integrated into a regular class setting. In order to evaluate whether our intervention was effective, a variation of training programs were compared. We differentiated between a direct and an indirect intervention approach by using Moodle as a support. The main variables to determine the programs' effect were the manifestation of SRL strategy use and of Latin

translation achievement, particularly considering the accuracy of translation as well as the students' self-reported and actual strategy use.

6.2.1. Theoretical background of self-regulated learning and translation work

The present study was founded on SRL theory and on considerations regarding translation work, aiming for a conflation of these two concepts. Our study's model (cf. Figure 5) is based on the framework of self-regulation (Pintrich, 2000) that emphasizes a procedural character of SRL comprising phases (planning, monitoring, control, reflection) during which self-regulation activities are assigned to cognitive, motivational, behavioral, and contextual processes.

During the *planning phase*, the learner approaches the task at hand and employs cognitive activities, such as goal setting strategies (Pintrich, 2000) that are particularly useful for structuring the completion of the task, and serve as guiding principles that help to measure individual progress. In terms of motivational processes, motivationally advantageous goal orientations (Dweck, 1999) determine the learner's engagement in the task, provided that the learners have firm beliefs in their capabilities (Bandura, 1997). Self-evidently, the learners also have to perceive the value of the task by judging the relevance and importance of their involvement (Wigfield & Eccles, 1992).

Self-regulated behavior concerns the management of time sequences (e.g., reserving fixed time slots for homework), whereas the contextual aspects are targeted on the learners' perception of the learning environment (e.g., distractions) that may influence their proceeding.

In the *monitoring* and *control phase*, the learners increase the awareness related to their own learning behavior. Control processes (Corno, 2004) come into use with the aim to regulate cognition (e.g., adaptation of strategy application), motivation (e.g., self-motivation), behavior (e.g., help-seeking), and context (e.g., elimination of distractions). As there is little

empirical evidence for a definite separation of monitoring and control processes (Pintrich, Wolters, & Baxter, 2000), we combined both phases, which makes our model comparable to the cyclical model of SRL by Zimmerman (2000).

During the *reaction* and *reflection phase*, the learners' performance and adequate strategy application are evaluated on the basis of their attribution style (Weiner, 1986). Depending on the result, future planning and goal setting are influenced so that a new process of learning is initiated. In this context, the adoption of a positive attitude toward mistakes helps to regard failure as an opportunity to sustain the learning process (Brooks & Goldstein, 2004).

To bridge the gap to the translation process, we transferred the general model of translation of Nida and Taber (1969) to the context of Latin translation and integrated the translation process as a domain-specific component into the framework of self-regulation (cf. Figure 5). The postulation was that the impartment of both SRL and translation strategies is substantial to establish expertise in Latin translation, but also to transfer the acquired competencies to other contents (e.g., reading comprehension) and subjects (e.g., English for speakers of other languages).

In parallel to the SRL process, three phases were distinguished: *decoding* (text preparation), *transfer/recoding* (strategies for transposing the text's content into the target language), and *restructuring* (strategy evaluation, correcting). A well-structured and decoded text provides an excellent foundation for the transfer of the original text into the target language. Hence, the training program focused on the instruction of the following *decoding* strategies (cf. Souvignier & Mokhlesgerami, 2006):

1) *Organization strategies* are targeted toward text structuring and help to organize the information in the first reading. They include clarifying unknown vocabulary and analyzing the grammatical elements and syntactic functions (Keip & Doepner, 2010).

2) *Elaboration strategies* are useful to develop a first understanding of the basic messages of the text (e.g., thinking about the headline, taking notes while reading the text). In this connection, the activation of prior knowledge (e.g., "What do I already know about this?") plays an important role because it incites a linkage of concepts.

While translating (*recoding*), word choice and expression have to adhere to target language norms in order to recode the original text accurately. Linked to this is a profound semantic analysis. It sensitizes students to uncover specific meanings of words and sentences and to ask themselves questions and formulate expectations with respect of the thematic progression, to make sure that the text is understood.

After completion of the translation (*restructuring*), the learners are requested to evaluate their strategy application and to make corrections aiming at a close conformation to conventions of the target language. The final model implies that SRL skills help to track whether the use of translation strategies has led to a satisfactory processing and translation of the text and therefore provides a framework appropriate for conceptualizing a translation environment.

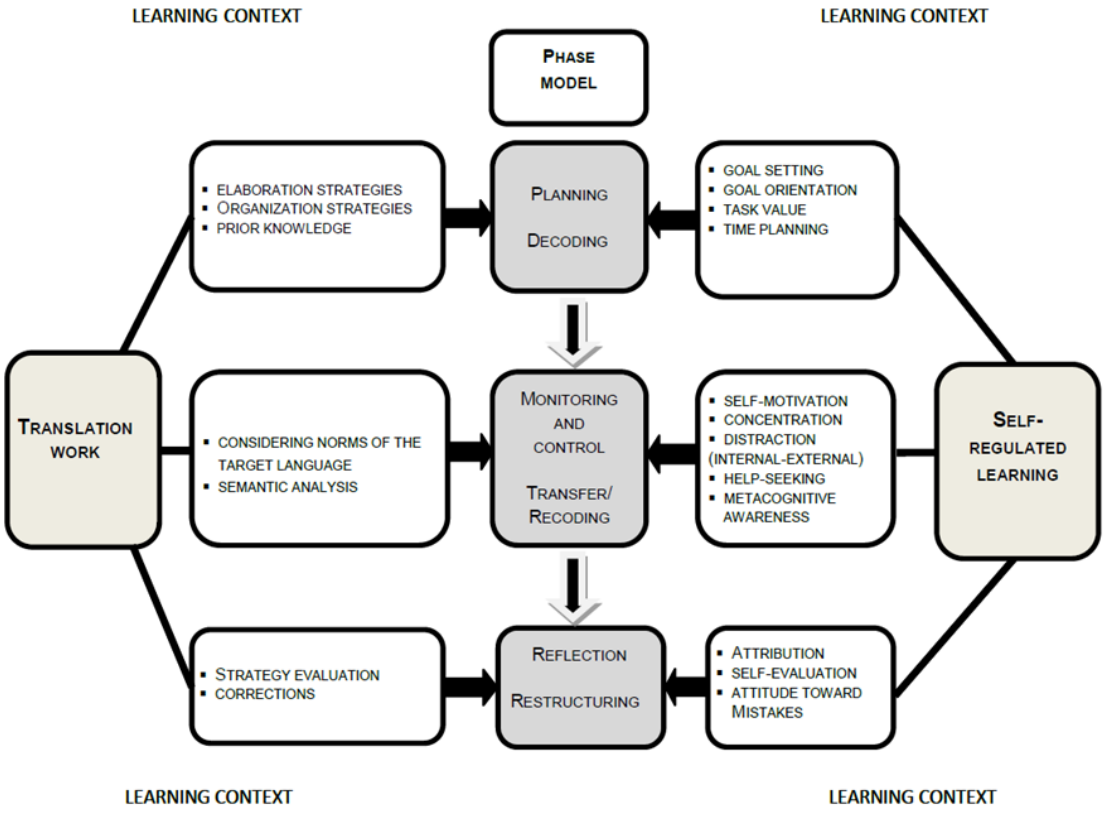

Figure 5. Framework of SRL and translation [in adaptation of Perels et al (2004)].

6.2.2. Promoting self-regulated learning

Intervention programs aiming at fostering SRL have been proven to result in the enhancement of SRL and academic achievement (Dignath et al., 2008).

Most of these studies have operated in the fields of mathematics (Perels, Dignath et al., 2009), reading (Souvignier & Mokhlesgerami, 2006), and writing (Graham et al., 2005).

Studies on SRL in foreign language learning or translating, however, are underrepresented and mostly deal with English as a foreign language (Chularut & DeBacker, 2004). As far as dealing with information in Web-based or hypermedia learning systems is concerned, research has revealed that learners have deficient skills (Azevedo, 2005). In general, the investigation of SRL processes in connection with virtual learning environments

is still quite rare but should increase in view of the growing practical implementation of LMS (e.g., Blackboard, Moodle).

First results of recent studies have indicated a positive impact of open learning contexts in virtual format on students' learning development, particularly showing that Moodle as an LMS is an efficient medium to promote SRL and to raise students' motivation and knowledge (e.g., Núñez et al., 2011). On this basis, our intervention program aiming at increasing students' self-regulatory abilities and translation competency by means of a Web-based learning scenario via Moodle can contribute to the field.

As far as the form of intervention is concerned, different variations have been shown to be effective (cf. Kistner et al., 2010). First, an intervention can be directly targeted at the group whose skills are intended to be improved (e.g., students; Perels et al., 2005). Second, following the indirect approach (De Corte et al., 2004), the learning environment is optimized by addressing individuals that are responsible for the assistance of developing those skills (e.g., teachers). The present study realized both approaches in order to identify the most effective concept. On the one hand, students themselves acquired the training strategies directly via Moodle without their teachers as intermediaries, and on the other hand, teachers received instructions via Moodle and were qualified to transfer the training contents to the classroom, whereas their students did not have access to a Moodle course. Additionally, there was a group in which both the students and their teachers participated in a Moodle course so that mutual spill-over effects were expected.

6.3 Research goals

Our research interest focused on investigating whether the conclusions from the framework of SRL and translation would hold in a Web-based setting implemented in Latin class. To test the effectiveness of an intervention program in terms of increasing students' SRL and translation competency (translation accuracy, self-reported, and actual strategy

application), different forms of training were applied (direct/DT, indirect/IT, combination/ComT). Our major assumption was that each training form via Moodle would have a significant positive impact on students' SRL abilities and translation competency, and thus that all training groups (EG) would outperform a control group (CG) which was not involved in the training procedure. Specifically, we anticipated that a combination of the training measures would lead to higher learning gains in students than would the training forms separated from one another. As a supplement, we intended to explore whether different effects between the single training groups could be identified.

6.4 Method

6.4.1. Research design

The study employed a 2 × 2 factorial design to investigate the effects of DT (+ / -) and IT (+ / -) on students' SRL and translation competency (accuracy, self-reported, and actual strategy application). For the intervention, we applied two factors that were embedded in a longitudinal design, with two measuring points and a time interval of three weeks. Interaction effects between type of training and time fall under the scope of investigation. The participants were assigned to one of four conditions: sDT (single direct training $DT^{+}IT^{-}$), sIT (single indirect training ($DT^{-}IT^{+}$), ComT (a combination group $DT^{+}IT^{+}$), and CG (control group $DT^{-}IT^{-}$).

6.4.2. Participants and procedure

Participants included 336 students altogether from secondary school (174 girls, 158 boys, 4 not specified) who were in their third or fourth year of learning Latin, with an overall mean age of 15.87 (*SD* = 7.98) years. They were recruited from two German federal states of Western Germany. The recruiting process was partially randomized: Any grammar school in the catchment areas that offered Latin as a subject was contacted and asked for its interest in

participation. After confirmation, the teachers were given encompassing information sheets for students and parents, which contained the study's details, the central principles of data privacy, and a reference to the voluntary nature of participation.

The sample was matched by the propensity score matching procedure (Austin, 2011) in order to correct for sample selection bias and baseline differences between EG and CG, arriving at a reduced sample of 274 students (143 female, 127 male, 4 not specified) with a mean age of 15.12 years (*SD* = 1.13). The data of this more homogenous sample were applied to the analyses, whereby the numeric distribution to the single conditions was the following: sDT (N = 47), sIT (N = 54), ComT (N = 36), and CG (N = 137).

6.4.3. Intervention

Between pre- and posttest, the intervention was conducted differentially for the various training groups. The contents of sDT and sIT were parallelized, but the teaching techniques differed from each other. In the sDT, strategies were directly targeted at the students, whereas in the sIT, the focus was on giving teachers instructions on how to impart the given strategies to their students.

Direct training intervention (sDT)

In sDT, the students worked in a self-regulatory manner, with the training contents that were provided via Moodle. Both self-regulatory and domain-specific Latin translation strategies were dealt with. In an introductory section, the students read up on some knowledge-units about SRL and translation strategies that were comprehensibly preprocessed in compact theory sheets with many illustrating examples in order to provide an external structure (e.g., a translation map). The succeeding three thematic units were adapted to the phases of our model (cf. Figure 5). Each week, the students had to complete one section, and to internalize the corresponding aspects of SRL (e.g., goal setting) and of the translation

process (e.g., strategy evaluation). In order to consolidate their new theoretical knowledge, the pupils had to work on different tasks and exercises.

Two external trainers were especially skilled in the training contents and conditions. They gave feedback within a tight time frame regarding the worksheets that the students had completed and uploaded. It was warranted that the students received help around the clock and that the Web material was permanently updated.

Indirect training intervention (sIT)

The teacher training was also designed as a Web-based program via Moodle in which the teachers acquired the training contents in a self-regulatory manner and acted as multipliers. The introduction was formed by a face-to-face kick-off seminar during which the general proceedings were presented. Thematically, the program was adapted to the content spectrum of sDT (cf. Table 8), offering a general thematic introduction and three thematic units based on the framework of SRL and translation. The material comprised theoretical descriptions, illustrative examples, and application tasks. All units were complemented with download files for the direct realization in class.

The contents of the teacher training were supposed to be passed on to the students, aiming at the creation of a conducive environment which allows for the enhancement of self-regulatory behavior and translation competency. There were also some general tools (e. g., discussion forums) that permitted the trainees to discuss issues among each other and to exchange experiences. Table 8 provides an overview of the trained strategies and the tools that were used for the impartment, as well as what the participants could draw from the training (action).

Table 8

Learning Contents of the Direct (sDT) and Indirect (sIT) Intervention Program

General content	Action sDT	Tool sDT	Action sIT	Tool sIT
Goals and Expectations	Learn about participants' expectations Clarify misunderstandings Clarify the training's objectives	Forum	Learn about participants' expectations Clarify misunderstandings Clarify the training's objectives	Forum
Introduction of general concepts SRL strategies Translation strategies	Input on self-regulatory skills in general Raising awareness with regard to the own state of knowledge	Information sheet	Input on self-regulatory skills in general Raising awareness with regard to the own state of knowledge	Information sheet
Self-regulatory content				
Goal setting	Importance of goal setting	Work sheets	Suggestions for integrating goal setting strategies	Download files
Time planning	Importance of creating time-schedules	Forum	Suggestions for imparting time-management strategies	Forum
Self-motivation	Control of procrastination		Suggestions of teaching self-motivation and volitional strategies	Work sheets
Distraction (internal and external)	Control of distraction			
Self-evaluation	Encourage reflectivity		Suggestions of including positive feedback	
Attribution	Dealing with failure			
Domain-specific content				
Activation of prior knowledge	Information about the character of Verres and the historical background	Thematic handout	Suggestions for introduction to the topic of "Cicero's oration against Verres"	Download files
		Quiz		Forum
Organization strategies	Working with guidelines concerning text structure and analysis of syntactic features	Translation road map	Suggestions for structuring guidelines	Work sheets
Elaboration strategies	Decoding of a text (e.g., marking of conjunctions)			
Formulation of the translation (Ciceros's orations against Verres)	Recoding of a text	Work sheets	Suggestions for instructing the recoding of texts	
		Forum		
Semantic analysis	Formulating content-related expectations Exchange of experience on the formulation of content-related expectations		Suggestions for integrating questions regarding the students' expectations in terms of thematic progression	
Strategy evaluation	Analysis of common mistakes Solving a text puzzle in order to step back through the process of translation	Work sheet	Suggestions for stimulating strategy evaluation	

Combination (ComT) and Control group (CG)

In the ComT, the direct and indirect interventions were assembled. Hence, the teachers and their students were trained simultaneously in the manners outlined above. The CG, however, did not receive any form of intervention. Thus, teachers and students underwent their habitual lessons without any added information about the self-regulated translation process. Notwithstanding, the teachers were asked to assure that comparable prose texts were handled in the classroom that warranted a similar base activity in the training groups (EG) and in the CG.

6.4.4. Instruments

In general, the effectiveness of our training program was evaluated through the triangulated assessment of students' self-report data combined with objective data, such as test scores, and the extent to which students actually applied the trained strategies. Additionally, in line with Leard and Hadwin (2001), log-file data viewable in Moodle were taken into consideration, with which the off-line data could be validated. The instruments will be described on the students' level only.

SRL: A standardized questionnaire was used to measure students' SRL skills. The responses were rated on a scale ranging from 1 (*definitely not true*) to 4 (*definitely true*). The content validity of the questionnaire was ascertained employing items from established instruments (e.g., Pintrich et al., 1991). Some items were newly developed or logically modified, if necessary. The internal consistencies for the overall SRL skills and the various subordinated scales can be seen in Table 9 and can be rated as satisfactory.

Table 9

Summary of Reliability Estimates for Self-regulated Learning (overall) and the Scales Planning, Monitoring and Control, and Reflection

OVERALL/Scales	**Items**	**Reliability (Cronbach's α)**	**Retest-Reliability (r_{tt})**	**Example**
Self-regulated learning	60	t_1 .90 t_2 .93	.86***	
Planning	16	t_1 .67 t_2 .82	.78***	I make good use of my study time in Latin instruction.
Monitoring & Control	25	t_1.81 t_2.84	.83***	When I study, I find my mind wandering to other things.
Reflection	19	t_1 .76 t_2 .84	.75***	After studying, I think about what to improve.

Note. t_1 = pretest/ t_2 = posttest.
***$p < .001$.

In order to assure the concurrent criterion validity, we interrelated the SRL competency in the posttest with two training indicators:

1) Trace Data: Moodle allows the collection of digital traces of students' learning behavior in order to construct profiles of the frequency of SRL activity across participants. Thereby, a connection between actual and self-reported learning behavior can be identified which is increasingly demanded in the field of research (Veenman, 2011). The correlation between on-line and off-line assessment is generally reported to be low (Veenman, 2005). In our study, the extent of SRL (overall) judged by the questionnaire correlated significantly .33 ($p < .01$) with the corresponding trace data. Thus, we could presume an acceptable validity of the used self-assessment questionnaire referred to the training sensitivity.

2) Content analysis of students' submitted worksheets: The quality of the students' submitted worksheets (e.g., the preparation of time schedules) was analyzed in percent of total performance (maximum of 403 points = 100%) and transformed into the grading system (94-100% = outstanding). As a result, a moderate Spearman-correlation coefficient of $\rho_{cc} = -.43$ ($p < .001$) between the grades and the overall SRL skills was attained. Thus, this training marker indicated a good criterion-related validity of the questionnaire scores in the posttest.

Translation competency: The students' translation competency was assessed by a standardized experimenter-designed Latin translation test for each point of measurement. The overall competency was subdifferentiated into the *translation accuracy* and both the *self-reported* and *actual strategy application*. The tests consisted of a text that was kept in prose form and was oriented toward Cicero's rhetorical work *De oratore* (text passage$_{pretest}$ 2, 217-290; text passage$_{posttest}$ 2, 18, 75). Both versions of the text were conceptualized comparably regarding length and the amount of difficulties (e.g., grammatical constructions). In order to ensure content validity, the texts were designed in consultation with experienced Latin teachers. For appraisal of the convergent criterion-related validity, the students' pre- and posttest translation achievement scores were correlated with the Latin marks of a recent classroom exam (Time 1: $\rho_{cc} = .47$, $p < .01$; Time 2: $\rho_{cc} = .45$, $p < .01$) and with the last report marks (Time 1: $\rho_{cc} = .53$, $p < .01$; Time 2: $\rho_{cc} = .56$, $p < .01$).

The discriminatory power was satisfactory for all sections of both achievement tests (r_{it} each > 0.60). In addition, the texts showed a medium level of difficulty ($P_{t1} = 57.66$; $P_{t2} = 67.67$). A certain aspiration level was indispensable in that the students had to be challenged to first decode the text strategically rather than directly start translating it word-by-word. The texts were subdivided into nineteen parts. The test evaluation was standardized: Two independent raters used a prepared schema and were blind to each other's scores, arriving at adequate interrater-reliabilities (Cohen's $\kappa_{pretest/posttest} = .81/.83$).

Translation accuracy was gathered by the quality of the students' final translation and rated on a scale from 0 to 3 (stylistically wrong – stylistically accurate). The quantification of the *self-reported strategy application* (scaled from 1 to 4) referred to the students' subjective strategic self-assessment by means of questionnaire items that asked them to estimate their decoding, recoding and restructuring abilities. Satisfactory reliabilities were revealed for all scales (cf. Table 10).

Table 10

Summary of Reliability Estimates for Self-reported Translation Strategy Application and the Scales Decoding, Recoding, and Restructuring

OVERALL/Scales	Items	Reliability (Cronbach's α)		Retest Reliability (r_{tt})	Example
Self-reported translation strategy application	23	t_1 .84	t_2 .89	.61**	
Decoding	8	t_1.65	t_2.74	.54***	I underline phrases in each sentence.
Recoding	12	t_1.83	t_2.85	.57***	While translating I formulate expectations concerning the thematic progression.
Restructuring	3	t_1 .68	t_2 .76	.52***	I check if I skipped an important step.

Note. t_1 = pretest/ t_2 = posttest.
**p < .01; ***p < .001

The *actual strategy application* referred to visible structuring and meaningful marking of the text, and was rated from 0 (no marking) to 3 (each grammatical element highlighted).

6.4.5. Information with regard to data analysis: Propensity score matching

Based on the propensity score matching method (cf. Austin, 2011), the subsamples of the (aggregated) experimental groups and the CG were matched to control for baseline differences regarding a circumscribed set of relevant variables. Thereby, we aimed at creating a more homogenous pool of control participants. We checked some relevant sociodemographic variables (sex, actual year of learning Latin) and initial competency markers (recent Latin test and report mark, baseline-competencies of SRL and translation) for pretest discrepancies. There were no significant level differences for any of the listed variables except for the initial translation competency, $F(1, 343) = 834.57$, $p < .05$. When gathering this control variable, an auxiliary matrix program matched each experimental subject with a statistical twin from the CG. Thereby, we chose a threshold value of medium height ($c = 0.1$[6]) in order to warrant a justifiable balance between dyad resemblance and

[6] We conducted various matching trials starting with a very high *c*-value of 0.5 that was successively diminished (iterating matching procedure). *c*-values higher than 0.1 failed to leveling the baseline translation differences. *c*-values lower than 0.1 resulted in considerable

sample size. In the resulting homogenized sample, the baseline differences in translation competency were leveled, $F(1, 272) = 0.26$, $p > .05$.

6.5 Results

For the purpose of further controlling the data, we also examined potential pretest differences between the separate training groups (sDT, sIT, ComT). We found significant level discrepancies concerning the students' sex, χ^2 (2) = 11.46, $p < .05$ and their recent Latin test mark, Kruskal Wallis $H(2) = 6.22$, $p < .05$ (Kruskal & Wallis, 1952). Therefore, these two variables were controlled as covariates in all subsequent group analyses.

With regard to the study variables, no further pretest differences were found. In order to examine training-related benefits (i.e., increase of SRL abilities and translation competency from the beginning to the end of the training), data were subjected to various (co)variance-analytical procedures with time (pretest, posttest) as a within-subjects factor, and DT (+ / -) as well as IT (+ / -) as between-subjects factors.

Regarding the variables SRL and self-reported strategy application, we conducted multivariate analyses of covariance (MANCOVA[6]; cf. Figure 5). With regard to the variables translation accuracy and actual strategy application, univariate analyses of covariance were performed (ANCOVA). For convenience, subsequent contrast analyses and trend analyses for the different groups will be reported on the overall scales only. Table 11 presents the adjusted mean scores and standard errors of the groups.

sample reductions. Therefore, we stated with the 0.1-solution a *c*-value of medium height and, respectively, reached a medium matching quality arriving at a more homogenous reference group than in the starting solution.

Table 11

Means and Standard Errors for Self-regulated Learning (Overall), Planning, Monitoring & Control, Reflection, Translation Accuracy, Self-reported Strategy Application (Overall), Decoding, Recoding, Restructuring, and Actual Strategy Application for the four Groups at Pre- and Posttest (t1 and t2)

Dependent variable		Indirect (IT) -				Indirect (IT) +					
		Direct (DT) -			Direct (DT) +						
		M [a]	*SE*	*M* [b]	*SE*	*M* [c]	*SE*	*M* [d]	*SE*		
Self-regulated learning	t1[e]	2.50	0.03	2.53	0.05	2.54	0.06	2.53	0.06		
	t2[e]	2.40	0.04	2.75	0.06	2.50	0.06	2.59	0.07		
Planning	t1	2.50	0.03	2.55	0.05	2.54	0.06	2.56	0.05		
	t2	2.40	0.04	2.73	0.07	2.54	0.07	2.60	0.08		
Monitoring & Control	t1	2.57	0.03	2.57	0.06	2.60	0.06	2.52	0.07		
	t2	2.48	0.04	2.76	0.06	2.58	0.06	2.64	0.07		
Reflection	t1	2.57	0.03	2.62	0.05	2.60	0.06	2.65	0.06		
	t2	2.46	0.04	2.85	0.06	2.56	0.06	2.71	0.07		
Translation accuracy	t1	1.73	0.07	1.95	0.11	1.76	0.12	1.42	0.14		
	t2	2.04	0.06	2.27	0.11	1.92	0.11	1.69	0.13		
Self-reported strategy	t1	2.34	0.04	2.40	0.07	2.41	0.07	2.43	0.08		
application	t2	2.31	0.04	2.70	0.07	2.55	0.07	2.60	0.08		
Decoding	t1	2.33	0.04	2.38	0.07	2.41	0.07	2.38	0.08		
	t2	2.31	0.04	2.66	0.07	2.54	0.08	2.54	0.09		
Recoding	t1	2.40	0.04	2.50	0.07	2.45	0.08	2.49	0.09		
	t2	2.36	0.04	2.77	0.07	2.62	0.08	2.62	0.09		
Restructuring	t1	2.28	0.05	2.31	0.09	2.38	0.09	2.43	0.10		
	t2	2.66	0.09	2.66	0.09	2.50	0.09	2.63	0.10		
Actual strategy application	t1	0.06	0.01	0.10	0.02	0.07	0.03	0.06	0.03		
	t2	0.10	0.03	0.27	0.04	0.24	0.05	0.18	0.05		

Note. Distribution of groups.
[a] $DT^{-}IT^{-}$ (control group (CG); N = 123).
[b] $DT^{+}IT^{-}$ (single direct training (sDT); N = 43).
[c] $DT^{-}IT^{+}$ (single indirect training (sIT); N = 48).
[d] $DT^{+}IT^{+}$ (combinated training (ComT); N = 33).
[e] t1 = measurement point 1, t2 = measurement point 2.

6.5.1. Self-regulated learning

The multivariate analysis revealed a significant three-way interaction time x DT x IT (cf. Figure 6) for the overall scale SRL, $F(3, 237) = 4.31$, $p < .01$, $\eta^2_{partial} = .05$, and so did the univariate analysis for the scales planning $F(1, 239) = 8.87$, $p < .003$[7], $\eta^2_{partial} = .04$ and reflection $F(1, 239) = 8.79$, $p < .003$, $\eta^2_{partial} = .04$.

As proposed, the EG had a higher level of self-regulatory abilities than the CG, $t(240) = 5.90$, $p < .003$, $r = .36$.There was a group-wise change showing a significant increase of sDT, $t(42) = -5.26$, $p < .02$, $d = .85$, whereas CG decreased its SRL skills significantly from pre- to posttest, $t(122) = 5.38$, $p < .02$, $d = .43$. A predominance of ComT could not be

[7] Bonferroni adjustment from alpha level $p = .01$ to $p = .003$ was used to correct for multiple testing.

revealed, $t(240) = 0.84$, $p > .02$. However, we found that sDT significantly outperformed sIT, $t(240) = 4.82$, $p < .003$, $r = .26$.

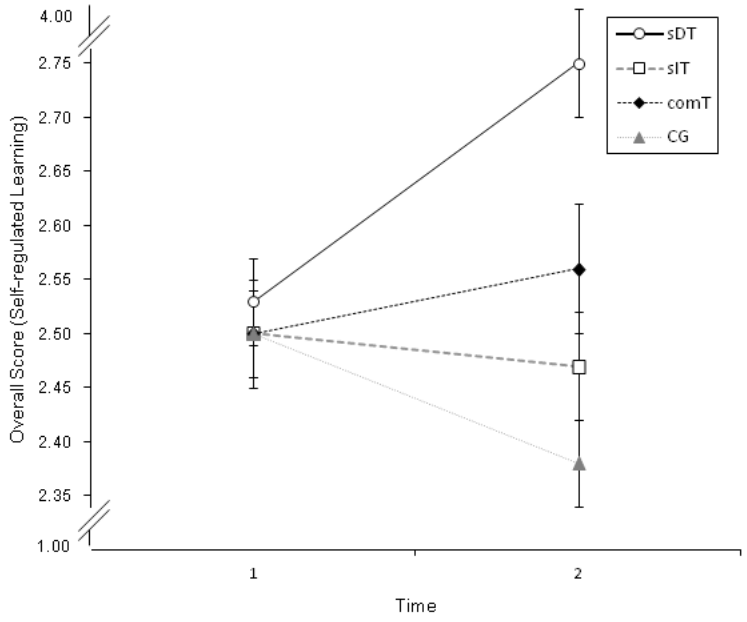

Figure 6. Depiction of the interaction time x DT x IT for self-regulated learning (SRL).

Note. sDT (single direct training: N = 43; DT $^{+}$ IT^{-}); sIT (single indirect training: N = 48; DT $^{+}$ IT $^{-}$); ComT (combinated training: N = 33; DT $^{+}$ IT $^{+}$); CG (control group: N = 123; DT $^{-}$ IT $^{-}$).
t1 = measurement point 1, t2 = measurement point 2.

6.5.2. Translation accuracy

In terms of accuracy, the results of the ANCOVA revealed no significant interaction between time and form of training. Nonetheless, a positive trend from pre- to posttest was identifiable in all groups, $t_{sDT}(43) = -3.12$, $p < .01$, $d = .58$; $t_{sIT}(48) = -2.00$, $p < .05$, $d = .34$; $t_{ComT}(31) = -2.66$, $p < .05$, $d = .37$; $t_{CG}(125) = -5.55$, $p < .001$, $d = .49$.

6.5.3. Self-reported strategy application

Looking specifically at the development of the self-estimated translation strategy application skills, the expected three-way interaction could not be found to be significant as well. Nevertheless, there was a significant two-way interaction DT x time for the overall scale, $F(3, 237) = 4.31$, $p < .01$, $\eta^2_{partial} = .12$, as well as for the scales decoding, $F(1, 239) = 8.66$, $p < .02$[8], $\eta^2_{partial} = .04$, recoding, $F(1, 239) = 6.46$, $p < .02$, $\eta^2_{partial} = .03$, and restructuring, $F(1, 239) = 9.84$, $p < .003$, $\eta^2_{partial} = .04$. This result indicated that the effect of DT did not depend on the levels of the IT factor (i.e., the gains of DT could be pronounced irrespective of the actual manifestation of IT). The groups with direct training (sDT, ComT) estimated their strategy use to be increased from pre- to posttest, $t(74) = -5.26$, $p < .02$, $d = .63$, whereas the groups without direct training (sIT, CG) recorded no significant change, $t(171) = -0.34$, $p > .02$.

6.5.4. Actual strategy application

For the actual application of strategies, a significant three-way interaction time x DT x IT (cf. Figure 7) was revealed, $F(1, 239) = 6.46$, $p < .05$, $\eta^2_{partial} = .03$. A subsequent contrast analysis resulted in a contrast between EG and CG, $t(246) = 3.82$, $p < .01$, $r = .24$ whereas a predominant effect of ComT could not be identified, $t(246) = -0.75$, $p > .01$. Beyond that, sDT and sIT showed nearly identical change patterns, $t(246) = 0.08$, $p > .01$. In general, all groups recorded a significant improvement of their actual strategy application, $t_{sDT}(42) = -3.14$, $p < .01$, $d = .49$, $t_{sIT}(48) = -4.42$, $p < .01$, $d = .68$, $t_{ComT}(31) = -2.53$, $p < .01$, $d = .42$, $t_{CG}(124) = -2.67$, $p < .01$, $d = .21$.

[8] Bonferroni adjustment from alpha level $p = .05$ and $p = .01$ to $p = .02$ and $p = .003$ was used to correct for multiple testing.

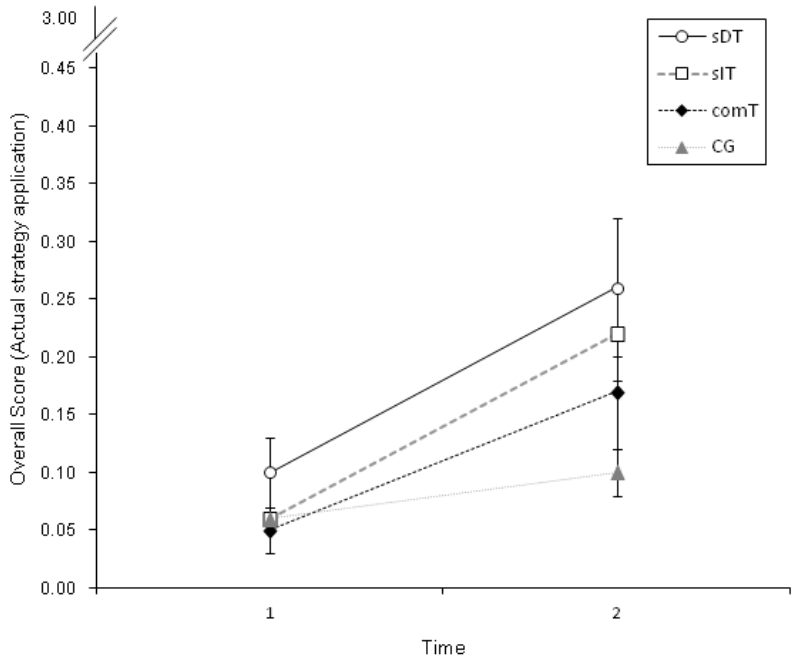

Figure 7. Depiction of the interaction time x DT x IT for the actual strategy application.

Note. sDT (single direct training: N = 43; DT $^{+}$ IT^{-}); sIT (single indirect training: N = 48; DT $^{+}$ IT $^{-}$); ComT (combinated training: N = 33; DT $^{+}$ IT $^{+}$); CG (control group: N = 123; DT $^{-}$ IT $^{-}$).
t1 = measurement point 1, t2 = measurement point 2.

6.6 Discussion

The primary aim of this study was to investigate the effectiveness of different training approaches for enhancing SRL and translation competency via Moodle. To shed light on this question, the manifestation of self-regulatory and translation strategy skills through training was examined with students under different conditions. We were successful in identifying important results that contribute both to the field of research and methodology for teaching.

In general, we found evidence for the effectiveness of the intervention in terms of the enhancement of SRL and translation skills because the training groups differed significantly from the control condition. Looking specifically at the development of the single groups (sDT, sIT, ComT, CG), we could not confirm a predominant effect of the combined training approach, but identified sDT as being superior.

Regarding the SRL skills, the significant three-way interaction time x DT x IT indicated that the difference in terms of an increase of SRL abilities between DT^{+} and DT^{-}

over time was moderated by the presence or absence of IT (i.e., the effect was more obvious in case there was no IT).

The same pattern of results arose for the specific aspects of the SRL process. The three-way interaction, however, was only revealed for planning and reflective skills rather than for monitoring and control skills. Additionally, an exploratory analysis yielded that sDT outperformed sIT, which was a further indicator of the predominance of the direct over the indirect approach (cf. Perels, Schmitz, & Bruder, 2003). Although sDT revealed promising results, the intervention neither led to a significant increase of all training groups nor to the highest improvement of ComT.

In this context, previous studies demonstrated that interventions are more effective, provided that external trainers are involved in the intervention (cf. Dignath, et al., 2008) rather than leave the implementation to the teachers alone. This finding might also explain our result. Presumably, the teachers themselves did not know how to apply, transfer, and communicate the SRL strategies imparted to them via Moodle to their students, which justifies the evidence of teachers' lacking knowledge about how to enhance SRL (Waeytens, et al., 2002) and of teachers' insufficient proficiency to implement the contents of an intervention program into the classroom (Souvignier & Mokhlesgerami, 2006).

Beyond that, the lacking synergetic effects of sDT and sIT in the ComT could be due to sIT counteracting the positive effects of sDT. The sIT might have interfered with students' processing of new strategies (Bannert, 2007) because the teachers' style of teaching deviated from their conventional practice and from the way strategies were provided in the sDT. Probably, the teachers were not able to establish the open and self-determined learning environment that was offered in the sDT. Because of that, interferences between self- and other-determined influences on the development of SRL skills might have occurred. Following the self-determination theory (Deci & Ryan, 2000), the students' intrinsic attitude toward the strategies they were confronted with and their willingness to adopt these strategies

might have been negatively influenced. Thus, the moderating function of intrinsic interest in the learning of new strategies should be controlled in future investigations. Besides, as the teachers themselves were unsure about their own self-regulatory skills, they might have struggled to compensate the students' problems with accepting the new strategies so that a mathematantic effect (Clark, 1990) might have occurred both on the students' and teachers' level.

Against this background, we pledge for an intensive partnership between researchers and practitioners in order for teachers to rethink their practice and feel supported in the management of substantial changes in the classroom. In line with other studies (e.g., Souvignier & Mokhlesgerami, 2006), we believe that the teachers of the sIT approach—which aimed at providing teachers with usable didactical suggestions within a fully developed program—did not identify with the study's concepts. As a consequence, to reduce barriers for the realization of interventions in general, the teachers' awareness of new concepts has to be created as early as possible in the teaching career (Maggioni & Parkinson, 2008) and their beliefs in enhancing SRL in particular have to be influenced before they are developed incorrectly based on their daily teaching practice (Dignath-van Ewijk & van der Werf, 2012). In this context, studies have shown that teachers who are self-regulated with regard to their own learning and who believe in developing their students' SRL skills are more likely to promote these competencies (Kramarski & Michalsky, 2009).

An explanation of the significant decline of SRL in the CG over time can be explained by the fact that the individuals developed an intensified self-attention (Carver & Scheier, 1981) and critical evaluation of their own self (Aronson, Wilson, & Akert, 2004), triggered by the first employment of the questionnaire at the first measurement point. As SRL was assessed by means of a self-report questionnaire, it is assumed that the self-judgment of one's own SRL abilities turned out to be more negative in the posttest.

The fact that a significant three-way interaction was specifically found for planning and reflective skills rather than for monitoring and control skills is striking. In terms of these framing aspects of the SRL process, the direct training approach appears to be most productive compared to an additional indirect measure. Indeed, distinctive planning skills that include the setting of realistic goals pave the way for a successful SRL process and are precondition for being motivated and focused on learning (Pintrich, 2003). Likewise, reflective skills allow for the evaluation of the learning outcome realistically compared to the self-set goals on the one hand, and on the other hand, for the realization that strategic adjustments are needed when learning was not effective. A combination of both training approaches seems to lower the effect, though. Notwithstanding, a synergetic effect could be found for the monitoring and control scale. When regarding the descriptive statistics (cf. Table 11), it is obvious that ComT could compensate for monitoring and control abilities showing a remarkable increase. Probably the synergy of sDT and sIT intensified the awareness in terms of the importance of strategy use, and therefore led to a conscious self-monitoring of learning behavior. To back up this assumption, sIT in isolation was inhibitory to the unfolding of monitoring and control skills. This interpretation should be ensured by process analyses that could provide continuous data concerning the development of monitoring and control abilities.

In terms of the achievement variables, no subdifferentiation within the single training groups in terms of a development from pre- to posttest was revealed. Nonetheless, the groups that received sDT showed a larger increase compared to sIT and CG. This result is an indicator of the transfer effect of cross-curricular (SRL) strategies to domain-specific (translation) strategies within a direct training intervention (cf. Souvignier & Mokhlesgerami, 2006). Regarding the translation accuracy, no significant difference in effectiveness of the training program between the groups was identified, even though all groups showed a significant growth. This result is striking because the improvement cannot be traced back to

the training, but probably resulted from the general increasing practice that the students received by being permanently exposed to texts, which is additionally confirmed by the significant improvement of CG. The students' accuracy was probably already developed to such an extent—given the advanced stage of students' experience with Latin—that the training did not succeed in achieving extra profit. As both EG and CG were exposed to the same type of text (prose) in regular class, and dealt with similar base activities, the uniform change over time can be explained.

Moreover, the students might have the attitude that accuracy is generally more dependent on vocabulary knowledge and the understanding of grammar (Lesaux, Kieffer, Faller, & Kelley, 2010) than on the conscious application of strategies. A longer intervention interval might lead to a stronger differentiation between the single groups because the accuracy could be more emphasized and conjoined with the importance of strategy use.

The results for the knowledge and actual application of strategies showed a slightly different result pattern. The findings for the self-reported employment implied that the groups that received direct training differed from the groups that were not directly instructed. In the absence of the direct condition, the training was not able to affect the participants' strategy knowledge, which could be related to the teachers' rigid thinking of whether and how strategies are important and should be applied. This pattern of result was reproducible for all phase-specific skills (decoding, recoding, restructuring) of the translation process. This was substantiated by a significant increase of the direct training groups (sDT, ComT). The desired effectiveness of the combined approach for the development of translation strategy knowledge implies that domain-specific strategies could be implemented and put into practice more successfully than the SRL strategies, which supports findings of an interconnection of domain-specific and cross-curricular strategies (Perels et al., 2005).

Concerning the actual strategy application, all groups made significant progress. Furthermore, a difference between EG and CG was revealed with the treatment group increasing significantly to a greater extent.

The general lacking predominance of ComT might be due to interference effects between familiar strategies and the innovative treatments, which might have disrupted the learners' usual translation routine. However, in light of the significant improvement of ComT for the self-reported strategy application, we can proceed from the assumption that there is still a discrepancy between strategy knowledge and its actual application (cf. Artelt, 2000).

To conclude, the results supported the assumption that Moodle served as a successful platform for directly enhancing both students' cross-curricular and domain-specific strategies, whereas the additional indirect training approach seemed at least effective for the impartment of subject-related competencies. In terms of SRL competencies, more guidance as well as a closer cooperation must be offered to the teachers in order to familiarize them with the importance of SRL. The involvement of teachers in the implementation of a training program by means of a LMS was innovative and helped to recognize deficits, but also potentials. The contrast of direct and indirect training interventions and combination of both has not been empirically examined very intensively, yet let alone realized, in a 2 × 2 × 2 design. Therefore, the present study was a further decisive step to raising the teachers' awareness for the importance of promoting cross-curricular competencies in their domain, but also to sensitize students to the facilitating role of having a broad spectrum of strategies. Moreover, the successful use of Moodle as a means of teaching could encourage and inspire teachers to deploy learning platforms to create a more open and self-determined classroom.

Nonetheless, there are limitations to the study that should be pointed out with regard to future studies. First, we expect larger effects in terms of the internalization and automatization of strategy report and actual usage (Pressley et al., 1987), particularly for ComT in cases where the intervention duration is longer than three weeks. This expectation is substantiated

by the findings of other studies that yielded the effect sizes of intervention programs increasing with the number of training sessions (Dignath & Buettner, 2008).

Further, it has to be taken into account that the analyses were to a large extent based on students' self-report data. Especially in terms of measuring SRL processes, self-report questionnaires are restricted because the extent to which the students can actually regulate their learning is difficult to reconstruct (Perry, VandeKamp, Mercer, & Nordby, 2002). Hence, there is a call for more on-line measurements, such as think-aloud protocols or direct observation, because they correspond to the learners' actual behavior and do not depend on their precise self-estimation (Veenman, 2011). To take this into account, we examined the relations among students' trace data, their worksheets' content, and the self-reports whereby the significant correlations were moderate and should be validated against other on-line measures (Veenman, in press). The problem of trace data is that the researcher can register behavior only at the object-level and has to infer the self-regulatory nature underlying that behavior. Notwithstanding, even though on-line measures also have their weaknesses (Veenman, Bavelaar, De Wolf, & Van Haaren, 2013) and self-report measurements are at least applicative for the assessment of a general aptitude in using self-regulatory processes (Pintrich, 2003), future research should strive for multi-method designs employing different assessment instruments in order to support construct validity (Veenman, 2007). The present study took a step in this direction by employing an LMS as a platform for directly training SRL and domain-specific strategies, and by making use of on-line information the LMS provided. As training effects were achieved with the training program, it should be expanded into a robust concept, setting higher priority on the multi-method approach.

7. Study 3 - Investigating the reciprocal relationship between self-regulated learning and academic achievement in Latin translation

7.1 Abstract

The aim of this study was to investigate the bidirectional relationship between self-regulated learning (SRL) and academic achievement using the example of the domain of Latin translation. Although it is widely accepted that SRL is an effective predictor of academic achievement in various fields, this impact has not been examined for Latin translation achievement. Moreover, little is known about the reverse effect of academic achievement on SRL. A total of 332 students with a mean age of 15.87 (*SD* = 7.98) participated in the study. A self-regulation questionnaire and a standardized translation test were employed to measure self-regulatory abilities as well as Latin translation achievement at two points of measurement. Results of a cross-lagged panel analysis revealed a significant impact of SRL on Latin translation achievement, while a reciprocal relationship could not be confirmed. Nonetheless, current research was enriched by further insights regarding the role of SRL for students' academic achievement and the reciprocal relation between SRL and academic achievement, which has not been sufficiently explored yet. The outcomes are discussed in relation to theory and to implications for practitioners.

Keywords: Self-regulated learning; Latin translation achievement; confirmatory factor analysis; cross-lagged panel analysis

7.2 Introduction

Knowledge of Latin makes it possible to enlarge the contingent of foreign words, technical terms, and scientific nomenclature. It specifically helps with the acquisition of other

languages, particularly Romance languages, that find their roots in the Latin language (Mavrogenes, 1987), as it sensitizes for the general concept behind the system of language. These are arguments that the departments of classical studies use as reasons for studying Latin. In view of the spheres of today's modern life and digital age, however, the question might arise whether learning Latin is still up-to-date and appropriate for young people to find their way in our fast-moving society.

The present article emphasizes the importance of learning Latin and its value for learning in general and for strategic behavior in particular. It has been shown that Latin not only supports the improvement of reading and writing skills (Kennedy, 2006; Masciantonio, 1977) but has also been resulted in increased verbal and mathematics scores in different standardized tests (e.g., Scholastic Aptitude Test; DeVane, 1997).

Considering the meager amount of research in the field of Latin instruction, the contribution of this study was to show that self-regulated learning (SRL) skills support the students' abilities to deal with original Latin texts and might help to track whether the use of translation strategies will lead to a satisfactory and accurate processing of texts. A number of studies embedded within different subjects (e.g., Perels et al., 2005) lend support that SRL is an important influential factor of academic achievement (e.g., Nota et al., 2004). Beyond that, there are rich descriptions of SRL behavior (e.g., Pape & Wang, 2003), which revealed that active and self-regulated learners are in a better position to control their learning, to handle demanding tasks and to manage the lifelong learning process ahead of them (Zimmerman, 2001). Therefore, we wanted to investigate whether the predictive value of SRL also applies to the studying of the cultural language of Latin, especially with reference to the domain of Latin translation achievement. The relevance of addressing this question is further substantiated by curriculum developers who have already begun to take interest into the promotion of SRL and to determine SRL as an important competency for learning Latin and dealing with difficult tasks (e.g., Corno & Randi, 1999).

In line with these preliminary considerations, we specifically adopted a bidirectional view concerning the relationship between SRL and academic achievement which still has not been researched sufficiently to make reliable statements (Spörer, Brunstein, & Glaser, 2006). This reciprocal causation assumes that SRL and Latin translation achievement influence one another over time. For analysis, cross-lagged panel designs are recommended as they function as indicator regarding the direction of causality between the variables and estimate the strength of the causal effects of each variable on the other (Kline, 2011). In the long term, the results are aimed at developing SRL intervention programs that are targeted at enhancing SRL skills and supporting academic achievement. Having an idea of the relations between the constructs might be helpful for the conceptualization and implementation of interventions in school context as well as for the transfer to other disciplines.

7.2.1. Self-regulated learning

SRL is considered to be "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000, p. 453). The focus of research differs slightly as far as models of SRL are concerned. Whereas Boekaerts (1999) postulated a model of SRL that consists of different layers, others accentuated the procedural character of self-regulation and suggested different phases (e.g., Zimmerman, 2000). As the model for our study, we referred to the framework for SRL by Pintrich (2000), who claimed that students may demonstrate different aspects of SRL (cognition, motivation, behavior, and context) within the different phases of the SRL process (forethought, planning, activation; monitoring; control; reaction, reflection). The present study was targeted at depicting the different aspects of each phase of Pintrich's framework of SRL considering them as modeling academic self-regulation.

In terms of the cognitive factors, we focused on the selection of strategies that help to regulate cognition. We made a distinction between planning activities that refer to students'

goal setting (Pintrich, 2000) as well as to self-reflection strategies (assessment of goal attainment) that help measuring whether the set goals were achieved.

Motivational factors included the students' intrinsic values as well as their perception of task difficulty (Li, Lee, & Soloman, 2007). For the purpose of this study, the operationalization of intrinsic value involved the personal interest in and perceived importance of Latin as a subject or of activities that are related to Latin (e.g., translating Latin texts), and was regarded as a determinant that contributes to intrinsic motivation (Ryan & Deci, 2000). The students' perception of task difficulty referred to the translation test that they had to take and to their confidence or otherwise in being able to deal with the task.

Behavioral factors concerned the monitoring of strategic effectiveness and the evaluation of previous behavior (e.g., time and effort management) in order to adjust it based on the assessment of its effect (e.g., putting more effort in the learning of vocabulary when the translation of texts is judged as difficult and time-consuming) (Schunk, 2005).

Contextual aspects were not included because context is typically regarded as shaping academic achievement mediated by self-regulatory activities (Pintrich, 2004), which was not in the focus of our interest.

7.2.2. Latin translation achievement

The ultimate goal of Latin instruction is the development of translation skills. Whereas computational (Irons, 2000), reading (Guthrie, Wigfield, & Perencevich, 2004), and writing (Graham et al., 2005) strategies have become central topics in research, no studies published so far have focused on how students deal with complex and difficult sentence structures that aggravate translating and present students with problems for which they would have to fall back on strategies to solve them (Sharoff, 2006; Thies, 2003). One has to bear in mind, that Latin is a language that is not spoken anymore and thus, is perceived as far away from the life of modern students. Latin sentences can be very long and nested containing several subordinate clauses, which can make translating challenging and frustrating. Exactly for that

reason, special support of students with developing effective strategies to read original texts in Latin is important.

Many students are not aware of their strategy knowledge (Hartman, 2001) and thus are not able to use strategies efficiently in order to solve complex tasks. Some students might not find it necessary to apply strategies or the classroom setting might not value deliberative strategy usage. Therefore, the present study emphasizes the importance of enabling students to flexibly select appropriate learning strategies and to monitor and control them during the translation process.

Before translating for example, decoding strategies help to prepare and organize the text by highlighting the most essential structural elements (e.g., subject, predicate, and object). As result, the structure should be simplified and the wording easier to grasp. While translating, word choice and expression have to adhere to target language norms in order to recode the original text accurately. In this context, the semantic analysis (i.e., figuring out the meaning of words and sentences) is particularly important as it sensitizes students to a content-specific interpretation and focuses their attention to the thematic progression of the text.

After completion of the translation, evaluation strategies are supposed to help assessing whether the strategy selection was successful or should be adapted in the future. If necessary, the translation should be revised and the wording be corrected. In this context, the payoff for other disciplines must not be underestimated. It has been shown that translating texts improves the translator's writing skills (Newmark, 1988) as it expands the understanding of both the foreign and the own language and fosters precision in the use of words.

7.2.3. The reciprocal relationship between self-regulated learning and academic achievement

Many studies have demonstrated the relevance of SRL for academic resilience and achievement (Nota et al., 2004; Pape & Wang, 2003; Zimmerman & Martinez-Pons, 1986).

For instance, it has been found that SRL positively predicts students' performance in domains such as reading comprehension (Wigfield et al., 2008), writing (Graham et al., 2005), science (Cleary & Platten, 2013) and mathematics (Perels et al., 2005). In this context, it has been shown that students who received SRL instruction achieved higher levels of academic performance than students who were not introduced to SRL strategies (Labuhn, Zimmerman, & Hasselhorn, 2010; Perels, Dignath et al., 2009).

Studies on SRL in language learning, though, are underutilized and mostly restricted to English for speakers of other languages (ESOL) (Chularut & DeBacker, 2004) or deal with special fields such as vocabulary acquisition (Tseng et al., 2006).

With respect to the role of SRL for Latin translation achievement, fundamental questions have to be approached, even though there already is an increasing preoccupation with self-evaluation and comprehension skills in view of better translations (Ott, 2008). The presumptions of this study were based on findings which showed that those factors of SRL (cognitive, motivational, behavioral), we paid special attention to, were considered correlating (Pintrich & De Groot, 1990) and contributing to academic achievement (Pintrich, 1989).

While SRL is regarded both as goal of and condition for learning processes (Brühwiler, 2006), mostly theoretical considerations and only very few data (e.g., Dermitzaki & Kiosseoglou, 2004) are available concerning the predictive power of academic achievement for SRL. It was revealed that high competencies in young people are favorable preconditions for an active regulation of learning processes (Artelt, Baumert, McElvany, & Peschar, 2003), whereby self-regulatory abilities are regarded as an important condition for academic achievement. This reciprocal relationship was, amongst other influential factors for competency acquisition, investigated in PISA 2003 for mathematics, science, problem solving and reading. Moreover, previous research revealed that prior domain knowledge is positively related to the use of key SRL processes (e.g., monitoring, and planning processes) and

negatively related to strategy application during hypermedia learning tasks (Moos & Azevedo, 2008).

Considering the need for more research in terms of clarifying the relationship between achievement variables and SRL processes, our study can be seen as a baseline study in terms of transferring already known theoretical and methodological considerations and previous empirical findings to the new domain of Latin translation with the intention to identify new insights on causal structures.

7.3 Research goals

The study's aim was to examine the relationship between SRL and Latin translation achievement. Data from a fully cross-lagged panel design were used to figure out if there is evidence of a bidirectional relation and to determine whether one path is stronger than the other. All variables were assessed at two points of measurement.

Our general expectations were firstly that SRL at Time 1 (T1) would affect Latin translation achievement at Time 2 (T2) and secondly that the achievement variable at T1 would be identified as a relevant factor for students' SRL abilities at T2. Additionally, against the background of existing research (e.g., Zimmerman & Martinez-Pons, 1986), we proceeded from the assumption that the impact of SRL on Latin translation achievement is stronger than for the reverse direction of causality. Keeping in mind that causality cannot be proven by longitudinal panel designs, the least we can expect is to reveal possible causal relationships (Burkholder & Harlow, 2003).

7.4 Method

7.4.1. Participants and procedure

The subjects comprised 332 students that were all in their third or fourth year of learning Latin (158 boys and 174 girls), with an overall mean age of 15.87 (*SD* = 7.98) years.

The students were recruited from secondary schools in two central catchment areas of Western Germany. A longitudinal design with two points of measurement was applied with a period of three weeks between them. The length of that retention interval was chosen in order to avoid that the increase of SRL and translation competencies would be based on the learners' maturation processes.

In the planning phase of the project, the headmasters and teachers of the relevant schools, as well as the parents of the potentially participating adolescents, were contacted and asked for their consent. For this purpose, information sheets were distributed and contained the central principles of data privacy and a reference to the voluntary nature of participation.

7.4.2. Instruments

Self-regulated learning (SRL): A standardized self-regulation questionnaire was used to measure students' SRL skills for two points of measurement (T1 and T2). The responses were rated on a scale with scores ranging from 1 to 4 (1: definitely not true; 2: tends not to be true; 3: tends to be true; 4: definitely true). The content validity of the questionnaire was ascertained by using items from established instruments (Pintrich et al., 1991). As necessary some items were newly developed. The standardized completion of the questionnaire was guaranteed by investigators that gave the necessary instructions during regular classes. Based on the framework of self-regulation (Pintrich, 2000) students' SRL was measured with six scales. In detail, the variables that were used are listed in the following:

Goal setting (e.g., "Before I start learning, I formulate learning objectives"), goal-attainment (e.g., "If I do not achieve my goal, I try to be more realistic in my goals"), intrinsic value (e.g., "I am mostly interested in the contents of Latin class in an extent, that I put all my efforts in them"), task difficulty (e.g., "I am convinced that I will meet the difficulty of that task"), strategic effectiveness (e.g., "I ask myself if my proceeding is effective"), evaluation

of behavior (e.g., "In case I have to do a difficult task, I adapt my learning techniques to meet the higher requirements"). Altogether, 18 items were used for the purpose of this study. The internal consistency of the subscales ranged from .36 to .80 at T1 and from .55 to .79 at T2. The overall SRL scale, which was of particular interest, showed satisfactory internal consistency (cf. Table 12) and an adequate level of test-retest reliability (r_{tt} = .73 across three weeks).

Latin translation achievement: In order to generate the construct of Latin translation achievement, the students' translation competency was measured by the translation accuracy of an original Latin text provided to them for each point of measurement. Thereby, logic, consistency, grammatical correctness, and written ability of expression in the target language were taken into account.

The texts were kept in prose form and were oriented toward Cicero's rhetorical work De oratore (T1: text passage 2, 217-290; T2: text passage 2, 18, 75). They consisted of four complex sentences which were subdivided into 19 sections consistent with the number of key elements that were relevant for scoring (e.g., accurate translation of subject and predicate). The maximum number of points was 57. Both versions of the text were conceptualized comparably regarding length and the amount of difficulties (e.g., grammatical constructions). The test was designed by the experimenter in consultation with experienced Latin teachers in order to ensure content validity. For appraisal of the convergent criterion-related validity, the students' translation achievement scores at T1 and T2 were correlated with the Latin marks of a recent classroom exam (T1: ρ_{cc} = .46, $p < .01$; T2: ρ_{cc} = .55, $p < .01$) as well as with the last report marks (T1: ρ_{cc} = .45, $p < .01$; T2: ρ_{cc} = .51, $p < .01$).

The discriminatory power was satisfactory for all sections of both achievement tests (r_{it} each > .60). Moreover, the texts showed a medium level of difficulty (P_{T1} = 55.67; P_{T2} = 65.33). A certain aspiration level was indispensable in that the students had to be challenged to first decode the text strategically rather than directly start translating it word-by-word

which would be opposed to a coherent overall understanding of the text (cf. Mokhlesgerami et al., 2007). The test evaluation was standardized: Two independent raters used a prepared schema and were blind to each others' scores. Hence, the interrater-reliability (Cohen's κ) was within adequate limits (cf. Table 12). Additionally, the achievement test had good test-retest reliability (r_{tt} = .69 across three weeks).

7.4.3. Data analysis

In order to investigate the relationship between SRL and Latin translation achievement, we chose a latent variable approach using structural equation modeling (SEM). More specifically, a cross-lagged panel analysis was applied by means of the software package Mplus (Muthén & Muthén, 2011) to test for bidirectional effects. All analyses were conducted using full information maximum likelihood estimation with robust standard errors (MLR) to take deviations from multivariate normality into account (Muthén & Muthén, 2011). Little's MCAR test (missing completely at random; Little & Rubin, 2002) indicated that the missing data in this study occurred completely at random (all p's > .05).

The degree of model fit was assessed using the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA) as well as the Standardized Root Mean Square Residual (SRMR). Regarding the CFI, values larger than .90 were desirable (Bentler, 1990). In terms of the RMSEA, Hu and Bentler (1999) have suggested <= .06 as the cutoff for a good model fit whereby less than .05 is an indicator for good fit, = .00 indicates exact fit, from .08 to .10 mediocre fit results and a fit greater than .10 indicates a poor fitting model. With regard to SRMR, well fitting models obtain values less than .05, while values as high as .08 are considered to be acceptable (Hu and Bentler, 1999). Furthermore, we included the Chi-square test statistic scaled by Satorra and Bentler (2001), which adjusts model chi-square for non-normality, whereby the relative chi-square should be less than 2 or 3 (Ullman, 2001).

7.5 Results

Prior to testing the proposed cross-lagged structural model, we employed confirmatory factor analyses (CFA) in order to test the extent to which the different indicators measured the latent variables as intended and to ensure construct validity.

In a second step, analyses were conducted using an autoregressive cross-lagged-panel model approach (Kline, 2011) to address reciprocal influences on SRL and Latin translation achievement. By employing a cross-lagged modeling technique, cross-effects are assessed representing the impact of one variable at T1 on another at T2 (Bollen & Curran, 2006; Mayer, 1986). Thereby, the cross-lagged effects describe whether the variable characteristics are related over time.

The autoregressive effects of a variable on itself measured at T2 represent the stability of the variable from one occasion to the next. The larger the autoregressive coefficient, the less changed the variable over time (Selig & Little, 2012). The adding of the autoregressive effects helps controlling the initial correlations between the variables.

Table 12 displays the descriptive statistics of the main variables as well as the bivariate correlations between the variables on latent level.

7.5.1. Test of measurement models

Measurement model I: Self-regulated learning

In order to address issues of multicollinearity, we chose a hierarchical-factor model distinguishing between two CFA models (cf. Hong & O'Neill, 2001). The main interest was focused on the second-order model. The initial first-order model was specified by six factors (goal setting, goal attainment, intrinsic value, task difficulty, strategic effectiveness, evaluation of behavior). Items belonging to the first-order constructs were subjected to an exploratory factor analysis (EFA) in order to check whether the items represent the

corresponding factors and whether they have acceptable factor loadings. All loadings were large (> .32; Tabachnick & Fidell, 2001) and all items represented one dimension. Three indicators were created for each of the six first-order factors. The second-order CFA suggested SRL as second-order scale comprising the six first-order subscales at the first and second measurement point.

The hypothesized final CFA model (cf. Appendix A) represented a good fit to the data with respect to both measurement points (T1: $\chi2 = 147.10$, df = 129, $p > .05$; $\chi2/df = 4.89$; CFI = .97; RMSEA = .03; SRMR = .07; T2: $\chi2 = 238.83$, df = 129, $p < .001$; $\chi2/df = 10.51$; CFI = .92; RMSEA = .06; SRMR = .08). All factor loadings were statistically significant ($p < .001$).

Measurement model II: Latin translation achievement

The structure of Latin translation achievement was specified by a second-order model, as well. The first order model was composed of four factors (Part1, Part2, Part3, Part4; cf. Appendix B) and represented the average score of points in each of the four sentences. These factors, in turn, were indicated by the standardized scores for each of the 19 sections that were assigned to the respective sentence. The CFA confirmed the structure of the model of Latin translation achievement. The fit statistics yielded an adequate fit to the data for both measurement points (T1: $\chi2 = 556.58$, df = 148, $p < .001$; $\chi2/df = 3.76$; CFI = .86; RMSEA = .09; SRMR = .07; T2: $\chi2 = 394.63$, df = 148, $p <.001$; $\chi2/df = 2.67$; CFI = .91; RMSEA = .07; SRMR = .05). All factor loadings were statistically significant ($p < .001$).

Table 12

Descriptive Scores and Correlations between the Variables in the Present Study

Descriptives						Correlations			
						SRL		LTA	
						T1	T2	T1	T2
		M	*SD*	α	*κ*				
Self-regulated learning (SRL)	T1	2.51	.44	.77		---	.75**	.15**	.21**
	T2	2.50	.48	.80			---	.22**	.29**
Latin translation achievement (LTA)	T1	1.67	.85		.82			---	.69**
	T2	2.02	.76		.84				---

Note. Means (*M*), standard deviations (*SD*), reliability (Cronbach's α), inter-rater reliability (Cohen's κ).
T1 = first point of measurement; T2 = second point of measurement.
Correlations refer to bivariate correlations on the latent level.
N = 332.
**$p < .01$, two-tailed.

7.5.2. Cross-lagged panel analysis

In order to examine the reciprocal relationships between SRL and Latin translation achievement, a cross-lagged panel model was specified (cf. Figure 8).

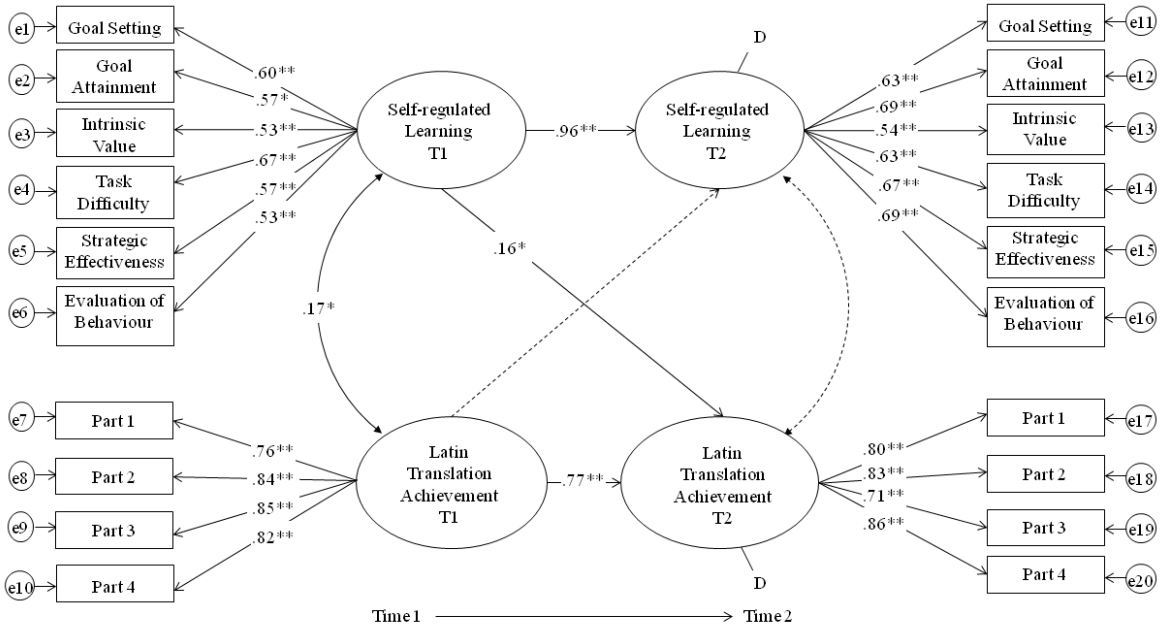

Figure 8. Cross-lagged panel model for self-regulated learning and Latin translation achievement across two measurement waves (from Time1 to Time2).

Note. e1 – e20 (error terms) indicate the unexplained variance of the manifest variables.
D (disturbance) represents the disturbance of the endogenous *latent* variables.
Solid lines indicate significant effects (*$p < .01$; **$p < .001$).
Dashed lines indicate paths with insignificant coefficients (# $p > .05$).

The full model provided a moderate fit to the data ($\chi2 = 733.34$, df = 164, $p < .001$; $\chi2/df = 16.26$; CFI = .80; RMSEA = .10; SRMR = .09). However, several paths of the model (e.g., achievement at T1 to SRL at T2) were small in magnitude and not statistically significant.

Regarding the cross-lagged pathways, the results show that the impact of SRL at T1 on Latin translation achievement at T2 was significant (ß = .16, $p < .01$), explaining 3% of variance whereas the path of Latin translation achievement at T1 to SRL at T2 was not significant ($p > .05$). Both stability effects were significant, with SRL at T1 predicting SRL at T2 (ß = .96, $p < .001$) and Latin translation achievement at T1 significantly predicting the

same variable (ß = .77, $p < .001$). In terms of synchronous effects, a modest association was found at T1 ($r = .17$, $p < .05$), whereas this finding could not be reproduced for the second measurement point revealing a non-significant correlation between the constructs ($p > .05$). This indicated a different association between SRL and Latin translation achievement for both measurement points.

Altogether, the model accounted for 66% of total variance of Latin translation achievement, whereas approximately 96% of total variance was explained for SRL.

7.6 Discussion

The aim of the study was to investigate whether SRL predicts change of Latin translation achievement over time and vice versa. While the relationship between SRL and academic achievement has received considerable empirical and theoretical attention (e.g., Zimmerman & Martinez-Pons, 1986), examining this relationship bidirectionally in the context of Latin class is new and therefore widens the scope of research.

Whereby other studies identified the aforementioned relationship for subjects such as science (Cleary & Platten, 2013) or mathematics (Labuhn et al., 2010), we can conclude that SRL abilities are associated with an improvement regarding the quality of translation that students produce in Latin class. The impact found might be low but cannot be negligible considering the diverse factors that can be related to academic achievement (Hattie, 2009).

The motivation for Latin as subject together with the ability to set precise goals and to pursue them, while constantly reflecting and evaluating previous behavior and the effectiveness of strategy usage, seemed to positively influence the students' strategy awareness (cf. Pape, Bell, & Yetkin, 2003). In consequence, students showed an improvement of their competency to transfer complex texts into the target language. In this respect, our finding might not only be constrained to Latin translation but be transferable to other contents (e.g., reading comprehension, problem-solving) and subjects (e.g., English for speakers of

other languages). To test for possible transfer effects might be especially interesting against the background that translating texts from Latin into the target language are regarded to be linked to reading (Masciantonio, 1977) and verbal competence (Newmark, 1988).

The reciprocal relationship between SRL and academic achievement has still been subject to little research to date, so that the present study marked a further step toward illuminating this connection also in view of future intervention studies. Previous interventions, particularly in the domain of text comprehension, demonstrated that powerful learning environments led to gains in declarative knowledge and use while effects on standardized performance indicators were smaller than one would have expected from the increase of strategic knowledge (De Corte et al., 2001). This finding might support our result as we examined the students' procedural knowledge in a standardized test rather than taking their knowledge about applying translation strategies and their actual strategy usage into consideration. Possibly, SRL would have been a better predictor of Latin translation achievement over time if we had included strategy knowledge and actual use in the study. Future intervention studies should therefore consider carefully whether or not the skills, that they intend to train, are conducive to success on future assessments. For research in the field of translation and text comprehension, we recommend to combine both declarative knowledge and strategy use with the actual performance on standardized measures.

Apart from that, the expectation that the impact of SRL on Latin translation achievement is stronger than for the reverse direction of causality was confirmed. Against our assumptions, the present study yielded no significant impact of the extent of Latin translation achievement on self-regulatory abilities, which contradicts the study results of other studies. Artelt et al. (2003), for example, corroborated a close connection between high competencies and the active regulation of learning processes. Based on this, the level of performance seems to play a decisive role for SRL. Why could not we reproduce this in our study? Firstly, we believe that revealing this relationship depends on the domain in which it is analyzed (Bong,

2001). Latin is a subject that might be accompanied by possible selection effects because especially achievement-oriented parents might claim to have their children studying Latin at school. As consequence, these students might bring along high level competencies due to a special encouragement.

To verify this assumption, we divided our sample post-hoc into high, medium- and low-achievers based on students' translation performance at T1 in percentages (maximum of 57 points = 100%) and identified a high performance group (scores above 53.3%) and medium-performance group (scores between 42.6% and 52.0%) while the low-performance group were those who scored below 42.0%. Comparing the mean achievements of the three groups at T1, the high performance group represented the largest portion. Therefore, our sample consisted mainly of high performers. With this knowledge in mind the lacking relationship between Latin translation achievement and SRL could be explained by the fact (cf. Artelt, 2000) that on the one hand the high performers did not consider it necessary to apply SRL strategies and thus underestimated the usage of these strategies. On the other hand, those who were low-performers felt it helpful to use such strategies and put special effort in applying them, but overestimated their self-regulatory abilities (Artelt, 2000). Therefore, we generally conclude that the level of performance might be influential for the development of self-regulatory behavior.

To substantiate this assumption, we additionally refer to research on students' academic self-concept (e.g., Marsh & Shavelson, 1985) which revealed that students have a distinct self-concept for each subject at school. As it is known that academic self-concept predicts academic outcomes (Marsh & Craven, 2006) and is affected by social comparison mechanisms, we would like to employ the contrast and assimilation effect (Marsh, Chessor, Craven, & Roche, 1995) to bring light into the findings of the present study. Both effects point into different directions because the contrast effect refers to the phenomenon that students do not think much of their abilities and have a lower self-concept when surrounded

by students with high abilities, whereas the assimilation effect applies to the fact that the students' self-concept is boosted when they are part of a high-achieving group. These contrasting effects may also have affected our findings as the large group of high-achievers in our sample may have had a positive self-concept as result of the assimilation effect and thus may have reported high self-regulatory abilities. On the contrary, the lower-performance group may have felt negative about their translation competencies due to the reference group effect and therefore estimated their SRL abilities as low. The effects may have counteracted each other and therefore neutralized the causal relationship between Latin translation achievement and SRL. Another explanation might refer to the big-fish-little-pond-effect (BFLPE; Marsh et al., 2008) according to which students of high-achieving schools have a more negative self-concept despite of a same performance level than students of low-achieving schools.

Resulting from that, we pledge for taking the academic self-concept into consideration as moderator variable when analyzing the relationship between academic achievement and SRL. In addition to that, the performance level of the respective participating classes and schools should be taken into account (Köller & Baumert, 2001). This is of special relevance when Latin instruction is the subject of investigation because Latin might be taught particularly at high selective schools.

Beyond that, we believe that there are other moderating factors that might influence the reciprocal relationship between SRL and academic achievement in general as well as Latin translation achievement in particular. As mentioned before, examining Latin students could entail the risk to deal with selective sampling. Therefore, an important aspect that could moderate the relationship between the study variables is the students' motive for learning Latin. Is it driven by self-determination, by parents' wishes or by the fact that Latin is mandatory at the respective school? We believe that those students that feel self-determined in choosing what they learn are better performers (Grolnick & Ryan, 1987) and thus might

report and show higher self-regulatory behavior. Other-determined students, however, might feel controlled in their choice of what they study at school, and might develop a passive and less self-regulatory attitude. The feeling of autonomy and self-determination should therefore also be regarded as moderator variable and be extended to the teachers' concession of autonomy to their students. In the context of education this means that teachers should create a learning environment in which students have opportunities for self-determination in order to support the development of intrinsic motivation for and identification with the contents of a certain context (Ryan & Deci, 2000).

While previous studies examined the moderational influence of contextual aspects (Artelt et al., 2003), one could also opt for a totally different approach claiming that contextual variables such as autonomy support are expected to act as predictor variables and SRL as a mediator variable (Pintrich, 2004). Because of that, we suggest testing the meditational model against the structure that assumes SRL as predictor, academic achievement as dependent variable and the aforementioned variables as moderators in order to test which constellation depicts the causal relationship the best. To find the most suitable model is crucial in view of the planning and realization of future intervention studies.

In light of our finding that self-regulatory learning skills are important for academic achievement, it is warranted to call for the support of SRL in the classroom (Dignath-van Ewijk & van der Werf, 2012) especially in the promotion of cognitive, motivational, and behavioral strategies because they represented the key factors of the SRL process.

7.7 Limitations

Although the present study provided interesting findings, there were some limitations that should be addressed in future studies. Taking into account that our results with regard to SRL were based on self-report data, we can only comment on the students' interpretation of their strategy application rather than on the actual use (Winne & Perry, 2000). Even though

self-report measurements help to reveal a general aptitude for the practice of self-regulatory processes (Pintrich, 2003), future intervention studies in this domain should consider supplementing self-report instruments by multi-method approaches (Veenman, 2011) (e.g., thinking-aloud protocols, log-file trace data, external assessments by teachers). This procedure would allow making more reliable statements concerning the students' actual self-regulatory behavior also with the purpose to provide a clearer picture of the reciprocal relationship between SRL and academic outcomes. A first step into this direction was the additional employment of a standardized test that reflected to some degree the students' actual usage of translation strategy and knowledge.

Another limitation of our study refers to the problematic characteristic of cross-lagged-panel designs as the length of the time interval between the measurement points might affect the magnitude of coefficients. Examining different time intervals between measurements have been shown to be difficult to compare and to reveal contradictory results (Delsing, Oud, & De Bruyn, 2005). In this respect, Kline (2011) noted that both very short and very long intervals between the points of measurement may cause low bidirectional causal effects.

Notwithstanding, cross-lagged-panel designs allow for examining the pattern of covariation between variables over time, for the investigation of bidirectional causality between variables and they help to estimate the relative stability of the variables over time. Future studies should assess the causal relationships over different periods of time to gain a more complete picture. Considering that we only included two waves of data, which is common for cross-lagged models, the conceptualization of change to a linear relationship between the variables of interest might be limited (Singer & Willett, 2003). That is why multi-wave panel data should be included (Ployhart & Vandenberg, 2010) and be analyzed by means of growth curve analysis (Duncan, Duncan, & Strycker, 2006) in order to study processes of change more thoroughly.

Beyond that, as the Latin students that participated in our study might represent a selective target group, we could envisage that a generalization across domains might generally be difficult. For this very reason it would be interesting to figure out whether a different result pattern would be revealed at least for modern language translation.

7.8 Conclusion

The present study suggests practical consequences for prospective interventions especially in the domain of text translation as it identified a supportive influence of SRL on students' Latin translation achievement. Although the directional influence of SRL on academic achievement is widely accepted and empirically evident, this relation has not been examined within the domain of translation in general or with regard to Latin texts in particular. Therefore, our findings are stimulating for future research because they indicated that a transfer of self-regulatory strategies to translation tasks in Latin instruction is possible and should be promoted in order to enforce sustainable learning. In this context, the development and conscious application of cognitive, motivational and behavioral SRL strategies seemed to be particularly effective for students to positively influence their learning outcomes.

It would be interesting to investigate whether the reciprocal relationship between SRL and academic achievement can be revealed in other domains and which additional factors possibly influence this relationship.

8. General discussion

There is very little research dealing with Latin instruction, and there are no intervention studies with Latin students as a target group. Perels et al. (2005) found that the training of SRL strategies combined with mathematical problem solving had the highest effects on SRL (see also Fuchs et al., 2003).

Consequently, in order to extend existing research, we examined SRL variables in the context of Latin translation and undertook a first step to combine SRL strategies with Latin translation strategies. In this, we were guided by the significance Latin holds for the acquisition of modern foreign languages (Mavrogenes, 1987) as well as for language skills in general (LaFleur, 1981). Furthermore, we were inspired by the indirect value Latin translation has for verbal competence (DeVane, 1997; Newmark, 1988) and reading comprehension (Kennedy, 2006; Masciantonio, 1977), as well as for solving complex problems.

The following section will discuss the studies that represent the various parts of the overall thesis.

8.1 Discussion of the interventions

The present thesis outlined the evaluation of two intervention approaches primarily aimed at the promotion of SRL and translation competency. Overall results demonstrated that our intervention programs were successful regarding the promotion of SRL and Latin translation achievement. Specifically, we showed that SRL and translation strategies, imparted separately, led to an improvement of SRL and translation competency, whereas the combination of both strategic approaches was not as effective as expected (cf. Perels et al., 2005).

This lack of strategic synergy might be due to interferences that may represent indicators of the so-called mathematantic effect (Clark, 1990), according to which the training

measures may have inhibiting effects for the process of learning, when learners try to substitute new strategies for accustomed ones. The conflict that arises between automated and innovative strategies may disturb the information processing and trigger adverse developments.

In addition, we found a predominance of a direct compared to an indirect training approach by demonstrating that students had a higher increase of their SRL and translation ability when they autonomously dealt with the training contents independent from their teachers. The combination of the training approaches did not result in the postulated predominant effect. In this case, the lack of existing synergetic effects led to the conclusion that reciprocal interferences may have caused these result patterns. This may be because the autonomy that the students experienced in the direct training approach might have been limited by the additional indirect teaching of the training contents by the teachers, who were not successful in further supporting their students' feeling of autonomy.

Furthermore, we were successful in integrating our training program into a Web-based learning environment. This approach was based on predecessor studies (e.g., Moos & Azevedo, 2008; Núñez et al., 2011) that indicated a positive impact of open learning contexts in virtual format on students' learning development, particularly demonstrating that Moodle can be regarded as an efficient medium to promote SRL and to raise students' motivation and knowledge (e.g., Núñez et al., 2011). Against this background, our intervention program, which aimed at increasing students' self-regulatory abilities and translation competency by means of a Web-based learning scenario via Moodle, substantially contributed to the field.

In general, the evaluation of our interventions revealed low to moderate effects with regard to the development of SRL and translation competency. Different aspects might have influenced the effectiveness of the training programs (cf. Pickl, 2004), such as (a) the number and length of training sessions, (b) the contents of the intervention, (c) aspects of the

individual (e.g., students' motivation and openness to get involved in the training, self-discipline, cognitive requirements), and (d) the method of imparting the training contents.

In terms of the duration of the training programs, we possibly would have achieved larger transfer effects, especially regarding the internalization and conscious application of strategies, if we had prolonged our sessions (Pressley et al., 1987). In this respect, Dignath and Buettner (2008) demonstrated that the effect sizes of intervention programs increased with the number of training sessions. Hattie et al. (1996), however, warned of the occurrence of a curvilinear relationship between promotion and assessment of performance, especially if the length of the interventions becomes too long.

As far as the interventions' contents are concerned, we carefully paid attention to an exact fit between the material provided and the goals that the training pursued, in order to foster transfer to other subjects and fields (Hager & Hasselhorn, 2000; Mokhlesgerami et al., 2007). Moreover, we designed the contents to be as motivating as possible by considering today's students' interests and lifestyle. Therefore, we also assessed different individual aspects (e.g., cognitive conditions) so that a variety of factors that could influence the training results were taken into consideration.

Future studies should consider these criteria as much as possible, and include them in their data collection, in order to maximize the intervention's effectiveness.

8.2 Discussion of the bidirectional influence between self-regulated learning and Latin translation achievement

With respect to potential cross-lagged relations between SRL and translation achievement, relatively small effects were found. In line with our hypothesis, the impact of SRL on Latin translation achievement was significant, whereas no significant influence could be revealed in the opposite direction. The presumed cross-lagged model design contributes to existing research because (a) it examined the relationship between SRL and academic

achievement with regard to a widely uninvestigated domain and (b) it attempted to identify bidirectional relations that included the impact of academic achievement on SRL. As this direction could not be verified as significant, a discussion on practical implications and open questions for future research was presented. In this respect, a special emphasis was given to taking possible moderator variables (e.g., self-concept, cf. Chapter 7.6) into account that could further influence the relation between the variables of interest.

Besides, because research that chooses Latin instruction as a subject of interest can be at risk of dealing with selective target groups, future studies should be aware of that problem and put more stress on the assessment of additional variables, such as socioeconomic conditions of the students' families or reasons for studying Latin. From this, we expect to expose the connection between SRL and Latin translation achievement more clearly.

Future studies should also include motivational variables (e.g., domain-specific interest) because Bong (2001) emphasized that motivation differs across different domains and subjects. In addition, Lepper, Corpus, and Iyengar (2005) reported low levels of motivation for older relative to younger children. That is why further motivational aspects, such as self-efficacy beliefs or self-concept, should be differentiated in order to allow a broader perspective on influential motivational factors, especially when the students attend higher classes.

8.3 Discussion of the instruments

Different measurements were used for the evaluation of the interventions. A self-regulation questionnaire was applied to assess students' SRL abilities. Additionally, objective data (standardized Latin translation test) were employed. All items of the SRL questionnaire were based on existing instruments (e.g., MSLQ by Pintrich et al., 1991; LIST by Wild and Schiefele, 1994) and adapted to the domain of Latin translation.

In Study 2, we made use of the opportunities and tools that the Web-based learning environment Moodle offers. In order to follow the urgent suggestion of Veenman (2011) to choose a multi-method approach to measure SRL and training outcomes, we analyzed students' trace data within the Moodle course as well as the contents of their submitted worksheets. By doing this, we aimed at reproducing actual instead of merely self-reported strategy application, with the result of improving construct validity.

Whereas some researchers have sharply criticized the employment of questionnaires (Veenman, 2005; 2011; Wirth & Leutner, 2008), others have emphasized their economic usability (Spörer & Brunstein, 2006) and have stressed that general aptitudes of self-regulatory behavior is measurable by means of questionnaires. The problem, however, is that data from questionnaires often does not correlate with performance measurements (cf. Veenman & van Hout-Wolters, 2002). This finding could serve as a possible explanation of this thesis' results because we also found only a low correlation between SRL and academic achievement (r = .16). Nonetheless, the reason why we employed questionnaires was that they can be administered to large groups (Veenman, 2011), they allow for easy data collection and analysis (Winne & Perry, 2000), and they provide an assessment of a general aptitude of the learners' use of different strategies (Pintrich, 2003).

Veenman (2011) made inaccurate reconstruction and recollection processes responsible for the low validity of off-line data gathered by questionnaires because the learners do not report their concurrent behavior but have to remember retrospectively how they behave in the situation asked in the questionnaire. That is why their data are based on subjective estimation and are therefore very open to interpretation.

Even though it is highly recommended to consider both on-line and off-line data, the school-based environment can be obstructive to a smooth execution of a multi-method approach. The application of instruments, such as thinking-aloud protocols or observations, is enormously time-consuming and requires special compliance of data protection rules. That is

why we also concentrated primarily on the employment of questionnaires within the framework that our training interventions already required a great proportion of teaching time.

In order to weigh the advantages and disadvantages of on-line assessments, Russo, Johnson, and Stephens (1989), for example, found that thinking aloud can both promote and impede task performance. On the one hand, thinking aloud forces participants to structure their working processes more strictly, which can result in better performance (cf. also Azevedo, 2005). On the other hand, the consistent verbalization of thoughts can be experienced as additional work load and thus cause a drop in performance (Russo et al., 1989).

The advantage of observation is the capturing of concurrent rather than of recalled behavior. Furthermore, verbal and non-verbal actions as well as social interactions between participants can be assessed (Boekaerts & Corno, 2005). A disadvantage could be that the observed behavior deviates from the students' natural behavior, so that an authentic insight is difficult to achieve. Besides, observations do not go beyond the examination of behavior and only provide limited data regarding whether individuals actually understand what they are doing (Winne & Perry, 2000). On top of that, observations are also restricted in assessing the whole SRL process because they require focusing on specific categories of SRL strategy use (Boekaerts & Corno, 2005).

To conclude, instead of realizing one on-line method completely, we tried to integrate a trace-data analysis in order to make use of a validation procedure. Nonetheless, in order to assess SRL, a number of both quantitative and qualitative methods should be applied and validated against each other. Hypermedia and Web-based contexts make new ways of assessment possible (e.g., trace data analysis) and should be considered as powerful tools for both enhancing and recording SRL actions.

8.4 Limitations of the intervention studies and implications for future research

Future research should address some limitations that were revealed in our interventions. Apart from the problems of the assessment of SRL and the collection of self-report data, there are other limiting aspects that can be clearly specified. First of all, we were not able to realize a complete intervention design in Study 1 because we could not recruit a group of students whose teacher would agree to devote the entire curriculum time to the teaching of only self-regulatory strategies.

In order to find such a comparison group, future studies may try to offer training sessions that are scheduled to take place in the afternoons. This way, the program would not interfere with the regular class or delay the requirements of the curriculum. In response to this, Study 2 was implemented into a Web-based learning platform, so that a complete 2 × 2 × 2 design could be easier realized and that was more independent from everyday school life. As a result, the effect of each training group, individually and combined, and in comparison to a control group, could be examined.

Another general limitation, which is due to the nature of field research, refers to the lacking possibility to randomize the investigated groups and to the associated increase of external validity. Therefore, the sample in Study 2 was matched by the propensity score matching procedure in order to correct for sample selection bias (Austin, 2011; Rosenbaum & Rubin, 1983). Matching intends to imitate randomization by generating a sample of groups that received the treatment, and thus is comparable of a selection of crucial observed covariates to a group that did not receive the treatment (i.e., the control group).

Future research should carefully weigh the advantages and disadvantages of a propensity score matching procedure. In general, it is a convenient method to balance treatment and control groups on different covariates without facing a high loss of data. We were successful in performing an optimal matching by assigning each treated individual to an

individual in the control group, so that the distance between the matched groups (statistical dyads) was minimized. Consequently, as in a randomized controlled trial, the different groups in the matched sample shared the same distribution of baseline characteristics.

However, whereas randomization tends to balance confounding factors and to consider unobservable factors, the matching procedure generally will not (Pearl, 2009). That is why bias due to latent variables may still be present after the matching procedure.

Another drawback of matching is that it requires large samples (Newgard, Hedges, Arthur, & Mullins, 2004) because the distributions of the confounders must overlap between the treatment groups (Rubin, 1979; Stuart, 2010), which, in turn, is accompanied by an eventual reduction of sample size. Consequently, matching reduces external validity because only a selection of treated individuals will be included in the analysis. Another problem of the matching procedure generally is that there are no standard regulations defining what constitutes a maximal acceptable threshold (Austin, 2011; Bacher, 2002). In our case, the goodness of matched samples was ensured by predefining such a threshold and successively reducing it until a justifiable balance of pretest differences and an acceptable sample size was obtained, whereby the reduction of sample size was kept as low as possible. The threshold that we used was of medium height (cf. Bacher, 2002).

To conclude, the propensity score matching procedure is a valuable tool for the analysis of observed data when randomization is not possible (Shadish & Cook, 2009), but it holds some limitations that need to be taken into account.

Another, more specific issue refers to the control of pre-existing differences and of potentially confounding effects of covariates. In Study 1, we employed an ANCOVA to control for pretest differences and to model the relation between the covariates and the dependent variable. Another possibility would have been to model the relation between the covariates and the treatment assignment by the propensity score method (Bacher, 2002; Stuart, 2010).

In a recent study, Nagengast, Marsh, and Hau (2013) outlined the advantages and disadvantages of both approaches and came to the conclusion that the effect estimates were similar (see also Rubin, 2001; Rubin & Thomas, 2000). Nonetheless, a substantial disadvantage of ANCOVA, in comparison to propensity score matching, is that it does not consider the overlap in the covariate distribution between the treatment groups (Nagengast et al., 2013) which can be negligent, especially when the covariate distributions between the treatment groups diverge strongly (e.g., Rubin, 2001). With regard to Study 1, we decided to limit our analysis to the employment of an ANCOVA because the sample sizes of the different groups were distributed at least approximately equally. Beyond that, the distribution in each group was relatively small, so that an additional propensity score matching procedure would have caused an unreasonably high loss of data.

A further aspect that should be addressed in future research refers to the characteristics of the target group that this thesis was related to. As mentioned before, Latin students are a special group of students because Latin is not considered to be a compulsory and necessary subject in the general public, so that there may be specific reasons for studying Latin (e.g., convictions and attitudes of the parents [cf. Dahlkamp, Friedmann, & Verbeet, 2009], foreign language provision at school, students' own initiative and interest). In addition, it is worth underlining that social comparison mechanisms and the extent of the self-concept might play a decisive role with regard to academic outcomes (Marsh & Craven, 2006). Whether these mechanisms are particularly obvious in students of humanities grammar schools in comparison to conventional grammar schools could be an interesting aspect for future research. As one tends to easily conclude that Latin classes have another social background and level of performance than do classes that focus on other foreign languages, researchers that examine the group of Latin students should be aware of these mechanisms and should determine whether these characteristics of Latin classes can be detected and generalized. When transferring these considerations to this thesis, the non-significant impact of Latin

translation achievement on SRL (cf. Study 3) might have been influenced by these social comparison mechanisms. As the students of our sample were, to a large extent, high-achievers, we assume that the contrast and assimilation effect (Marsh et al., 1995; cf. Chapter 7.6) may have counteracted each other and therefore nullified the causal relationship between Latin translation achievement and SRL.

For this reason, additional studies will be necessary to evaluate whether our findings can be verified or reproduced and whether our postulated model (cf. Study 3) is also appropriate for students in other subjects (e.g., modern foreign languages), or whether the effects found in this thesis are a matter of domain (cf. Boekaerts, 1999). All the described implications show that there are many possibilities to proceed with the improvement of self-regulated learning in natural settings.

In this respect, the central aspects mainly pertain to the development of the research design, to the use of randomization in the evaluation of the interventions' effectiveness, to the considerations concerning the selection of the target group, and to the specification of a domain to which the training contents are transferred.

8.5 Implications for practice

The open consultations in the first training sessions of our interventions unveiled problems and uncertainties that students have in their regular Latin classes, and needs that still must be addressed. Most students complained about having "difficulties maintaining an overview" when being confronted with long sentences. Others reported that they "get frustrated very quickly" and tend to "piece the text together in some way trying to make sense of the text rather unsystematically." Hartman (2001) confirmed these personal statements by showing that many students are not aware of their strategy knowledge and thus are not able to use strategies efficiently in order to solve complex tasks. Another problem might be that some students might not find it necessary to apply strategies, or their teachers might not support

deliberative strategy usage. Therefore, the present thesis contributed to the development of systematic programs that integrate both domain-specific and cross-curricular strategies in order to increase the transfer effect of general skills, such as SRL skills, to the development of other academic aspects. The fact that curriculum developers responsible for Latin instruction started to integrate SRL into the impartment of the Latin language at school (e.g., Corno & Randi, 1999) reveals the commonly accepted importance of SRL strategies.

In general, we pledge for a closer cooperation between researchers and practitioners in order to be able to detect deficits and promotion possibilities. For that purpose, the teachers' attitudes and awareness in terms of the relevance of SRL skills must be taken into account. In this respect, we believe that we could have recruited more teachers to participate in our studies if we had had a more intensive exchange with the teachers themselves in terms of their concerns and ideas related to the implementation of intervention programs (cf. Dignath-van Ewijk & van der Werf, 2012).

In terms of the time and the effort that is necessary to take part in intervention programs (three weeks + survey process at several points of measurement), versions that are more compatible with the conditions of the school context should be examined. As the programs presented in this thesis were shown to be effective, fostering domain-specific skills in connection with general skills should become a part of the classroom routine and should accompany students at every stage in their school career, beginning as early as possible.

8.6 General concluding remarks

Even though there are still a number of unanswered questions, our interventions provided valuable insights in terms of (a) promoting students' SRL and translation competency, (b) assessing and evaluating the data within a longitudinal design, (c) testing the underlying structure of the theoretical framework of SRL and translation, and (d) generating

new knowledge with regard to the significance SRL has for academic achievement in a widely uninvestigated domain. To sum up, the results that can be derived from the present thesis are encouraging and show the way forward for future intervention studies that intend to implement learning environments that promote self-regulatory abilities in school context, according to the theoretical foundation of Pintrich (2000). The distinctiveness of the interventions refers to the consideration of different aspects of the SRL process (cognition, motivation, behavior) as well as to the provision of learning material that take account of these aspects. The learning materials used on paper, but also in electronic form, offer teachers of secondary schools, especially for the domain of Latin instruction, valuable opportunities for application, flexible adaptation, and supportive activities in terms of self-regulatory abilities. In this context, we developed a manual that contained all material used in the trainings.

Finally, some of our findings join previous results with regard to the design of Web-based learning environments (e.g., Azevedo, 2005; Núñez et al., 2011) and show that the realization of a learning environment that is well-structured and adaptive to the nature of the SRL process successfully supports students' SRL in connection with challenging tasks.

The contents of the learning environment are accessible for all teachers that are interested in our training program. The only thing they need is the link to the Moodle course as well as the use of a guest account, or alternatively, the creation of an individual Moodle account. Consequently, the interventions described in the present thesis were successful in extending both the theoretical and empirical status of SRL and in providing practical measures and recommendations for regular class.

9. References

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10. Appendices

Appendix A

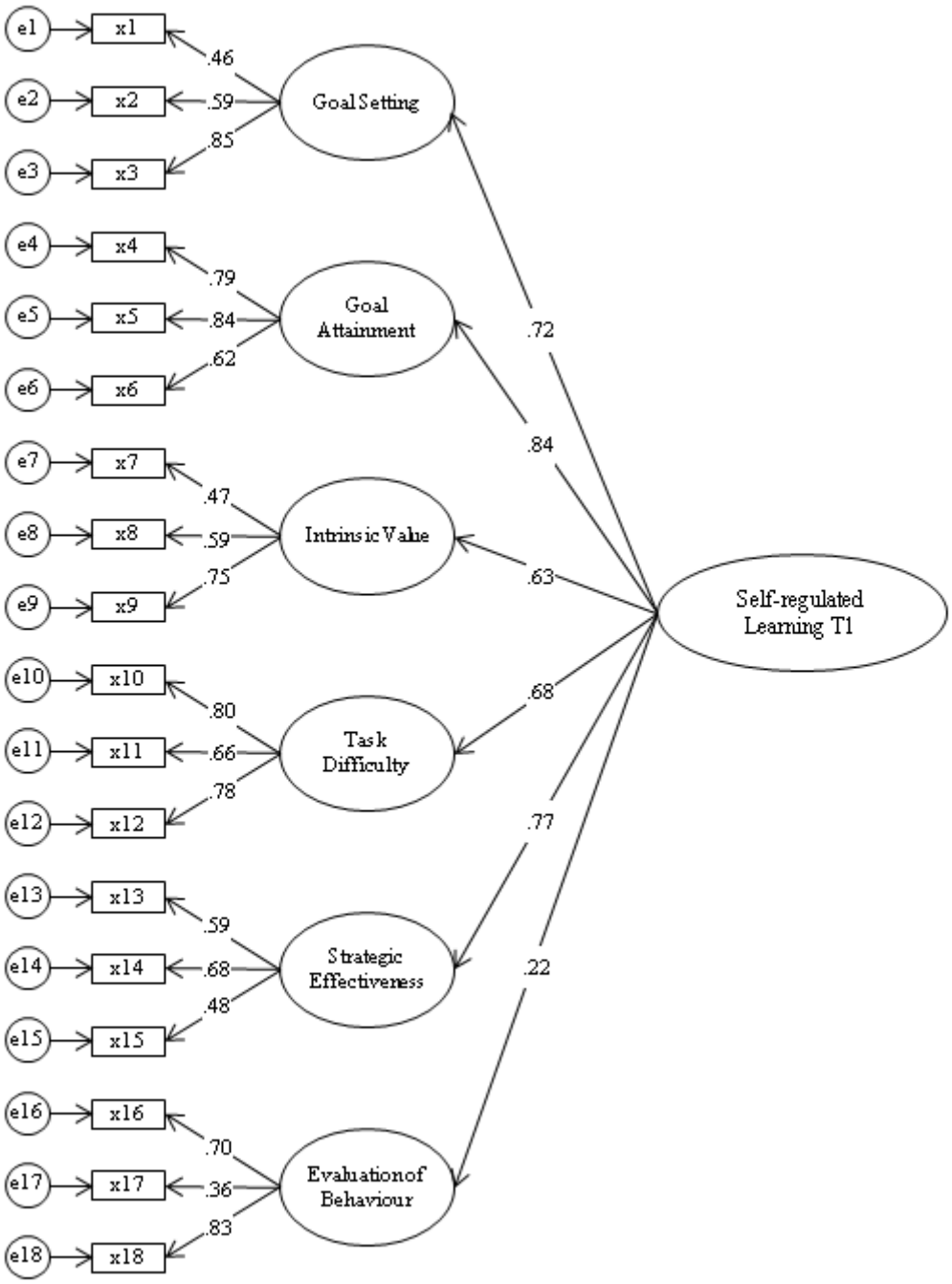

Figure A 1. Confirmatory factor analysis (CFA) of self-regulated learning at the first measurement point (T1).

e1 – e18 (error terms) indicate the unexplained variance of the manifest variables.
X1 – X18 represent the manifest variables (items).

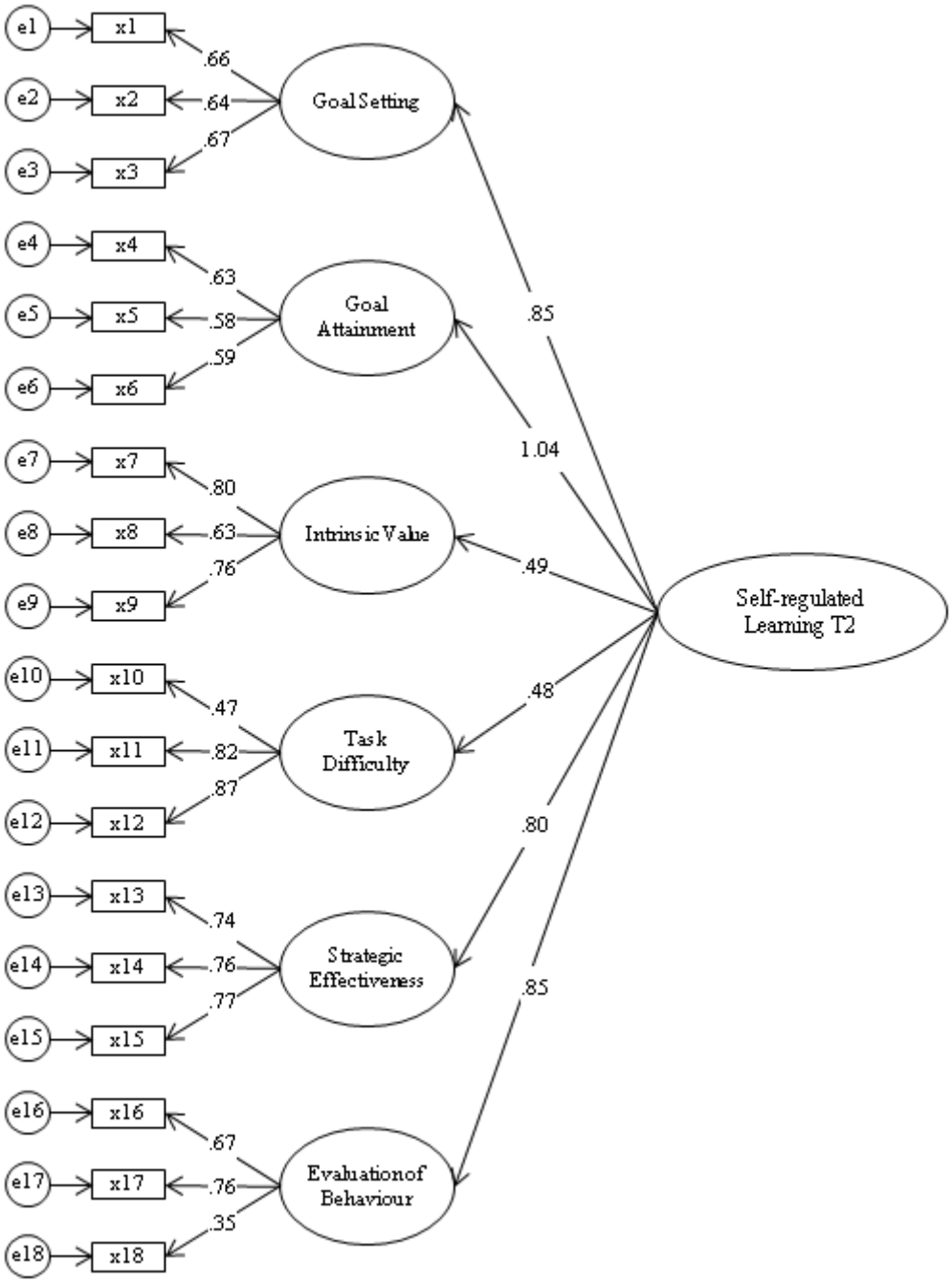

Figure A2. Confirmatory factor analysis (CFA) of self-regulated learning at the second measurement point (T2).

e1 – e18 (error terms) indicate the unexplained variance of the manifest variables.
X1 – X18 represent the manifest variables (items).
The standardised path coefficient from the first-order factor *Goal Attainment* to the second-order factor *Self-regulated Learning* exceeds one. This is not regarded as a problem as under certain conditions standardised regression coefficients greater than 1.0 can legitimately occur (Deegan, 1978).

Appendix B

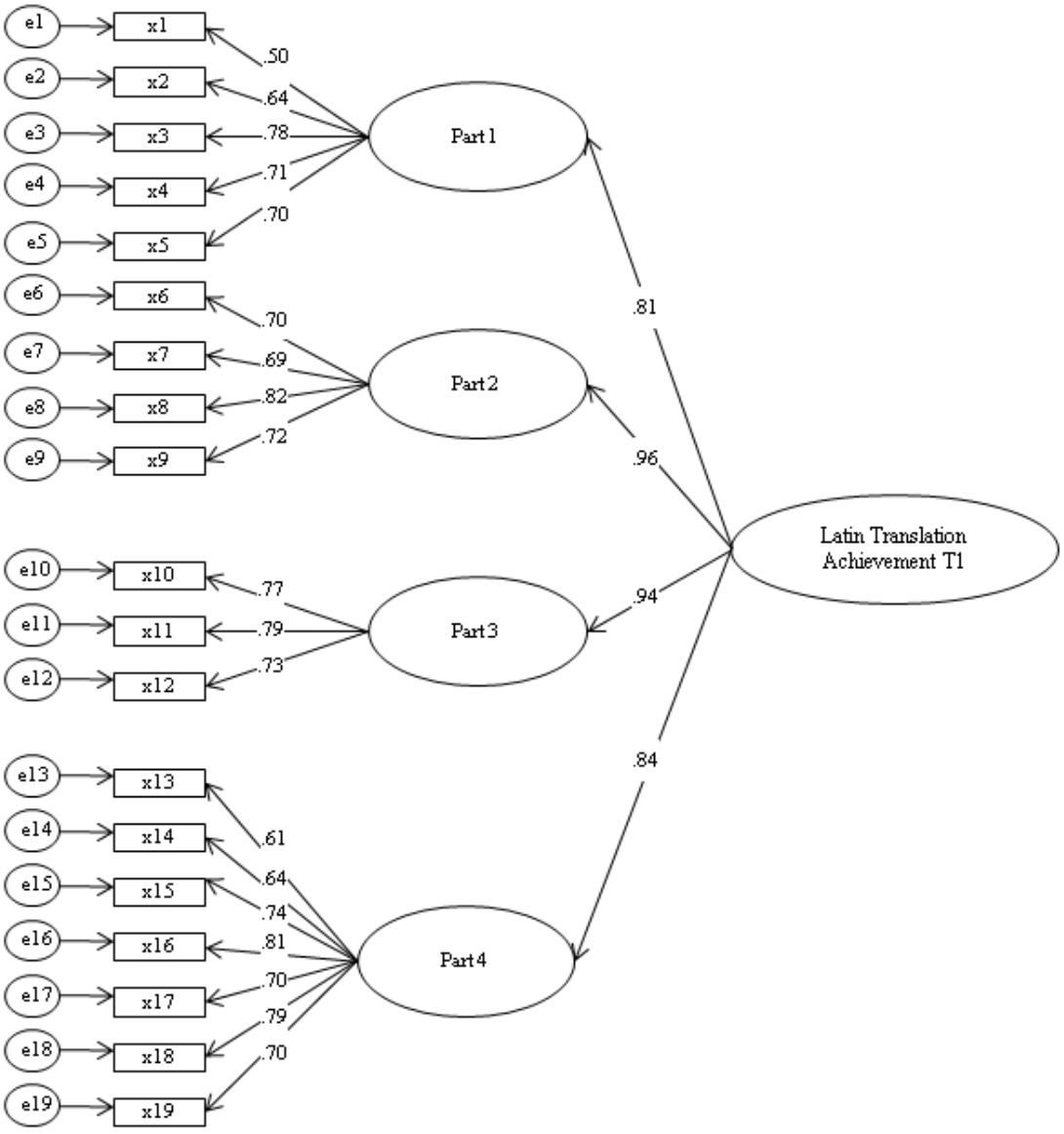

Figure B1. Confirmatory factor analysis (CFA) of Latin translation achievement at the first measurement point (T1).

e1 – e19 (error terms) indicate the unexplained variance of the manifest variables.
X1 – X19 represent the manifest variables (sections).
Part 1 – Part 4 represent the different sentences of the text in the achievement test.

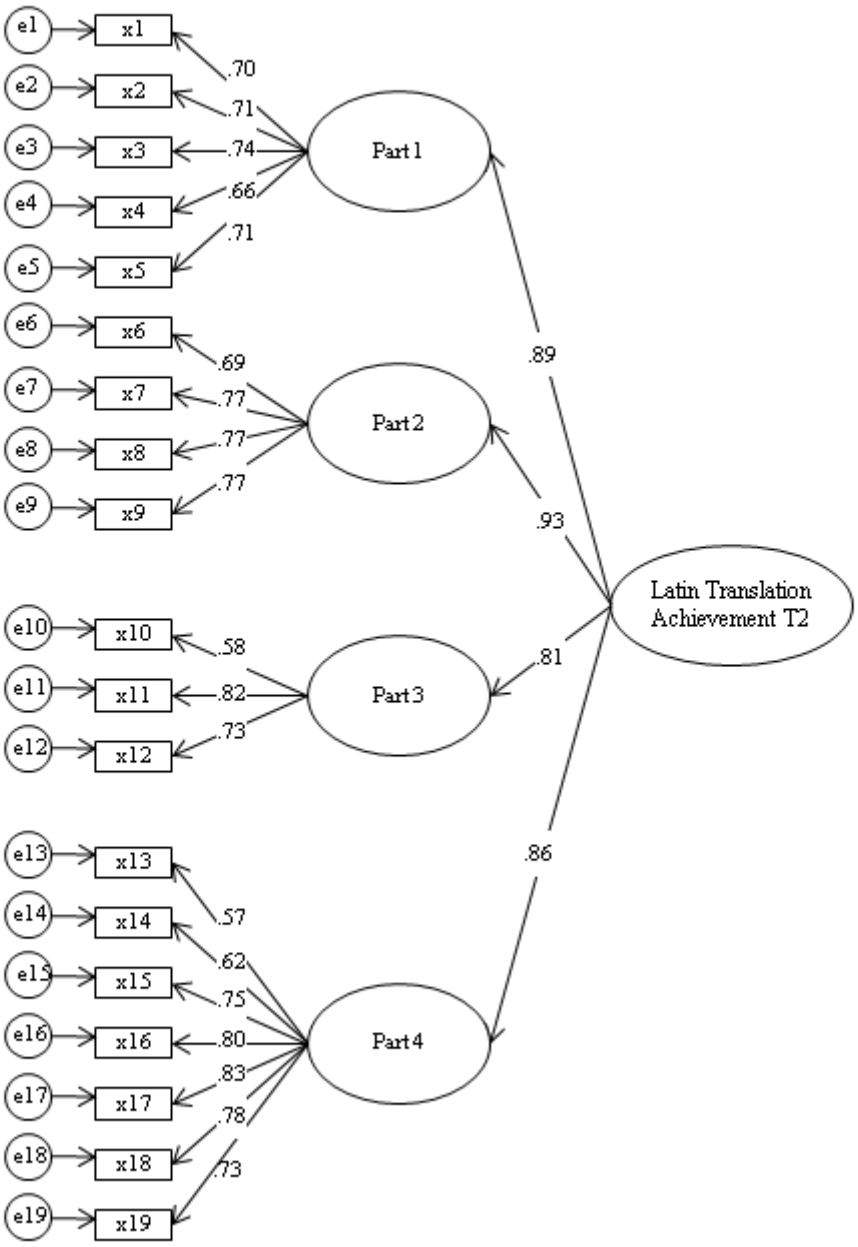

Figure B2. Confirmatory factor analysis (CFA) of Latin translation achievement at the second measurement point (T2).

e1 – e19 (error terms) indicate the unexplained variance of the manifest variables.
X1 – X19 represent the manifest variables (sections);
Part 1 – Part 4 represent the different sentences of the text in the achievement test.