Selbstreguliertes Lernen am Ende der Grundschulzeit: Ausgangslage und Förderung im Unterricht

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Selbstreguliertes Lernen am Ende der Grundschulzeit: Ausgangslage und Förderung im Unterricht

Im Rahmen der vorliegenden artikelbasierten Dissertation wurde selbstreguliertes Lernen (SRL) bei Schüler/-innen am Ende der Grundschulzeit untersucht. Bei SRL handelt es sich um eine Schlüsselkompetenz, die langfristig zu lebenslangem Lernen befähigt (z. B. Council of the European Union, 2002) und nach derzeit gültigen Lehrplänen (z. B. Bayerisches Staatsministerium für Unterricht und Kultus, 2000, 2014) auch schon in der Grundschule eingeübt werden soll.

Das Konstrukt des selbstregulierten Lernens fand etwa Mitte der 1980er-Jahre Einzug in die internationale Forschungsliteratur (z. B. Zimmerman, 1986) und beschreibt Lernen als eine Aktivität, die Lernende proaktiv ausführen, anstatt nur auf Erfahrungen oder Instruktionen in einer Lernumgebung zu reagieren (Zimmerman, 2001). Mittlerweile ist SRL ein etabliertes Konstrukt in der pädagogischen und psychologischen Forschung (vgl. Zimmerman & Schunk, 2011 für einen Überblick). Das Konstrukt bietet zum einen einen Rahmen, in dem vielfältige Einzelprozesse des Lernens beschrieben, untersucht, eingeordnet und in Beziehung gesetzt werden können. Zum anderen liefert es auch eine theoretische Grundlage für die systematische und umfassende Förderung von Lernverhalten und lebenslangen Lernprozessen.

SRL am Ende der Grundschulzeit zu untersuchen ist besonders reizvoll, da von Schüler/-innen zu diesem Zeitpunkt erwartet wird, zunehmend Verantwortung für das eigene Lernen zu übernehmen. Nachdem in der Forschungsgemeinschaft noch vor einigen Jahren diskutiert wurde, inwiefern SRL im Grundschulalter *überhaupt* möglich ist (Baumert et al., 2000), wurde mittlerweile gezeigt, dass viele Aspekte selbstregulierten Lernens durchaus von Grundschüler/-innen erlernt und ausgeführt werden können (Dignath, Buettner, & Langfeldt, 2008). Am Ende der Grundschulzeit (in der vierten Klasse) sind die meisten Schüler/-innen in Deutschland zwischen zehn und elf Jahre alt und damit in einem Alter, in dem in einigen SRL-Aspekten Verbesserungen möglich und – bei geeigneten Rahmenbedingungen – zu erwarten sind (Artelt, 2006; Bronson, 2000). Aufgrund der Komplexität des SRL-Konstrukts und der Tatsache, dass Lernverhalten von Schüler/-innen auch von aktuellen schulischen Rahmenbedingungen beeinflusst wird, gibt es dennoch viele offene Fragen.

Die vorliegende Arbeit zielte deshalb darauf ab, den Forschungsstand zu SRL bei Schüler/-innen am Ende der Grundschulzeit zu erweitern, wobei in spätere Studien auch die Erkenntnisse eigener vorangegangener Studien einflossen. Im Folgenden gebe ich einen ersten, kurzen Überblick über Ziele und Studien der vorliegenden Arbeit; eine ausführlichere Darstellung findet sich in den Abschnitten 2 und 3.

Bislang war wenig darüber bekannt, in welchem Maße Schüler/-innen, die nach dem aktuellen Lehrplan unterrichtet werden, darüber hinaus aber keine spezielle SRL-Förderung erhalten, SRL gegenüber anderen Lernzugängen (external gesteuert, impulsiv; Ziegler, Stöger, & Grassinger, 2010) bevorzugen. Deshalb wurde zunächst die Ausgangslage analysiert: Es wurde untersucht, welchen Lernzugang Schüler/-innen am Ende der Grundschulzeit bevorzugen. Eine Erkenntnis aus dieser Untersuchung war, dass die SRL-Förderung, wie sie derzeit laut Lehrplan im regulären Unterricht stattfindet, unzureichend ist. Wir nahmen an, dass die Lage aber verbessert werden könnte, indem Lehrkräfte im Unterricht ein bereits ausgearbeitetes, systematisches SRL-Training mit ihren Schüler/-innen durchführen.

Da im deutschsprachigen Raum bislang kaum evaluierte lehrergeleitete SRL-Fördermaßnahmen für Schüler/-innen am Ende der Grundschulzeit vorlagen, wurde in einem zweiten Schritt die Wirkung eines derartigen Trainings untersucht. Dabei wurde nicht nur die Wirksamkeit im Vergleich zum Unterricht nach Lehrplan nachgewiesen, sondern auch gezeigt, dass das kombinierte Einüben metakognitiver und kognitiver Strategien im Rahmen eines Modells selbstregulierten Lernens im Vergleich zu einem reinen Training kognitiver Strategien vorteilhaft ist.

Sowohl bei der Analyse der Ausgangslage als auch bei der Untersuchung der Wirkung des lehrergeleiteten SRL-Trainings lag ein besonderer Schwerpunkt auf der Situation hochintelligenter Schüler/-innen. Dieser Schwerpunkt wurde gewählt, da zwar nach wie vor die Annahme besteht, hochintelligente Schüler/-innen würden von sich aus selbstreguliert lernen und bräuchten somit keine spezielle SRL-Förderung (Treffinger, 2009), es sich aber aufgrund verschiedener methodischer Schwierigkeiten existierender Studien nicht entscheiden ließ, ob dies tatsächlich der Fall ist. Die Analyse der Ausgangslage ergab, dass sich hochintelligente Schüler/-innen, die den regulären Unterricht besuchten und keine spezielle SRL-Förderung erhielten, in ihrer Präferenz für SRL nicht von ihren durchschnittlich intelligenten Peers unterschieden und somit auch von einer SRL-Förderung profitieren könnten. Tatsächlich erwies sich die lehrergeleitete SRL-Trainingsmaßnahme auch für hochintelligente Schüler/-innen als förderlich.

Die mit dem im Rahmen der vorliegenden Arbeit evaluierten SRL-Training erzielten Effektstärken können zwar im Vergleich mit anderen lehrergeleiteten Maßnahmen im Klassenverband als gut bewertet werden, reichen aber nicht an Effektstärken forschergeleiteter Maßnahmen in Kleingruppen heran. Eine Möglichkeit, die Wirksamkeit der Maßnahme zu erhöhen, ohne die lehrergeleitete Durchführung im Klassenverband aufzugeben, besteht darin, die Vermittlung selbstregulierten Lernens noch besser auf die Zielgruppe zuzuschneiden. Eine Literaturanalyse ergab allerdings, dass man bisher noch wenig über die Gründe weiß, warum Viertklässler/innen bei den einzelnen vermittelten SRL-Teilprozessen Schwierigkeiten haben. Im Rahmen der vorliegenden Arbeit sollte deshalb ein Beitrag geleistet werden, um diese Lücke zu schließen. Vor dem Hintergrund der eigenen Studienergebnisse wurde also erneut die Ausgangslage untersucht, allerdings mit einem neuen Fokus: Exemplarisch für zwei SRL-Teilprozesse (Selbsteinschätzung und Zielesetzen) wurden mögliche Gründe untersucht, die erklären könnten, warum Viertklässler/-innen ohne spezielle SRL-Förderung Schwierigkeiten beim Ausführen der Teilprozesse haben. Die Ergebnisse dieser Untersuchung können zukünftig dazu dienen, die Vermittlung von Selbsteinschätzung und Zielesetzen im Rahmen eines ganzheitlichen SRL-Trainings mit Schüler/-innen am Ende der Grundschulzeit zu optimieren.

Im Folgenden werden in Abschnitt 1 zunächst die theoretischen und empirischen Grundlagen der Arbeit dargestellt, auf deren Basis die konkreten Ziele und Forschungsfragen der Arbeit formuliert wurden, die in Abschnitt 2 zusammengefasst werden. In Abschnitt 3 folgt ein Überblick über die vier in den Kumulus einfließenden Artikel, wobei an dieser Stelle auch die Wahl der jeweiligen Untersuchungsmethoden begründet wird und die jeweiligen Untersuchungsergebnisse berichtet werden. In Abschnitt 4 werden die Ergebnisse in Bezug auf die Ziele der Arbeit zusammengefasst und diskutiert, wobei auch Schlussfolgerungen für die Praxis abgeleitet und Grenzen der Arbeit dargestellt werden.

1. Theoretischer und empirischer Hintergrund

Dieser Abschnitt beginnt mit einem Überblick über Definitionen und Modelle selbstregulierten Lernens (1.1). Anschließend werden Befunde zu SRL im Grundschulalter (1.2), zu SRL-Trainings im Grundschulalter (1.3) sowie zu SRL bei hochintelligenten Schüler/-innen (1.4) dargestellt. Schließlich werden Befunde zu Selbsteinschätzung und Zielesetzen – den zwei im Rahmen der Arbeit genauer untersuchten Teilprozessen selbstregulierten Lernens – zusammengefasst (1.5).

1.1 Selbstreguliertes Lernen – Definitionen und Modelle

Zu SRL existieren zahlreiche Definitionen, theoretische Ansätze und Modelle, die sich zum Teil stark voneinander unterscheiden (für einen Überblick vgl. Boekaerts, Pintrich, & Zeidner, 2000; Zimmerman & Schunk, 2011). Vielen Definitionen ist gemeinsam, dass SRL als aktiver, konstruktiver Prozess beschrieben wird, bei dem sich Lernende eigenständig Ziele setzen sowie ihre Kognitionen, ihre Motivation und ihr Verhalten während des Lernens stetig überwachen, regulieren und kontrollieren (Pintrich, 2000). Dieses Verständnis wird auch in der vorliegenden Arbeit vertreten. Grundsätzlich lassen sich SRL-Modelle in Schichten- und in Prozessmodelle einteilen (Landmann, Perels, & Schmitz, 2009). Während in Schichtenmodellen (z. B. Boekaerts, 1999) die beteiligten Regulationsebenen im Fokus stehen, wird in Prozessmodellen der Lernprozess zeitlich gegliedert, und die Teilprozesse werden als Phasen bzw. Stufen dargestellt. Beide Modellarten können einen Rahmen für die Untersuchung einzelner Aspekte selbstregulierten Lernens bieten. Prozessmodelle eignen sich aufgrund ihrer zeitlichen Strukturierung zudem besonders gut als Basis für die Entwicklung von Interventionen und damit für die Förderung selbstregulierten Lernens. Da in der vorliegenden Arbeit sowohl Einzelaspekte als auch die ganzheitliche Förderung selbstregulierten Lernens untersucht wurden, wurde ein Prozessmodell als Rahmenmodell gewählt.

Ein sehr bekanntes Prozessmodell selbstregulierten Lernens stammt von Zimmerman (1986, 1989, 2000). Zimmerman vertritt einen sozial-kognitiven Ansatz (Bandura, 1986) und betrachtet Selbstregulation als triadische Interaktion aus personinternen, verhaltens- und umgebungsbezogenen Prozessen. Konkret untergliedert er den Lernprozess in drei Phasen, die *forethought phase*, die *performance phase* und die *self-reflection phase.* Die *forethought phase* beinhaltet Aspekte, die dem eigentlichen Lernprozess vorausgehen und ihn beeinflussen können. Zimmerman nennt hier zum einen die Aufgabenanalyse, zu der Zielsetzung und strategische Planung zählen, und zum anderen selbstmotivationale Aspekte wie Selbstwirksamkeit und Zielorientierungen. Die *performance phase* umfasst Aspekte, die während des Lernprozesses relevant werden, zum einen die Selbst-Kontrolle mit Aspekten wie der Nutzung aufgabenspezifischer (kognitiver) Strategien, Zeitmanagement und Strukturierung der Umwelt, und zum anderen die Selbst-Beobachtung, die in Gedanken stattfinden kann (metakognitive Selbst-Überwachung) oder mittels Aufzeichnungen. Die *self-reflections phase* findet nach dem eigentlichen Lernprozess statt. Hier werden zum einen Lernprozess und Leistung beurteilt, wobei Aspekte wie die gewählte Bezugsnorm oder die Art der Kausalattribution relevant werden. Zum anderen kommt es zu Selbstreaktionen, insbesondere zu positiven oder negativen Affekten und zu adaptiven oder defensiven Reaktionen. Auf diese Weise wird in der letzten Phase auch eine Verbindung mit der nächsten Lernaktivität und damit der nächsten *forethought phase* hergestellt. Obwohl das Modell von Zimmerman aus nur drei Phasen besteht, ist es aufgrund der zahlreichen beteiligten kognitiven, metakognitiven, motivationalen, affektiven und Verhaltensaspekte sehr komplex.

Da sich das Zimmerman-Modell aufgrund seiner Komplexität nicht für die Vermittlung von SRL an Grundschüler/-innen eignet, entwickelten Ziegler & Stöger (2005) ein vereinfachtes normatives Modell. Dieses Modell enthält kognitive und metakognitive Aspekte, die sich laut Metanalysen als besonders geeignet zur Vermittlung von SRL am Ende der Grundschulzeit erwiesen haben (Dignath & Büttner, 2008; auch Stoeger & Ziegler, 2008a). Das normative zyklische Modell umfasst sieben Stufen und gliedert den SRL-Prozess wie folgt: Ausgehend von einer Selbsteinschätzung der eigenen Fähigkeiten in Bezug auf konkrete Lerninhalte und das eigene Lernverhalten (Stufe 1) setzen sich Lernende angemessene Lernziele (Stufe 2) und planen ihren Lernprozess (Stufe 3). Dabei wählen sie auch geeignete Strategien aus, die sie beim Lernen zur Erreichung dieser Ziele anwenden (Stufe 4). Während des Lernens überwachen die Lernenden kontinuierlich ihren

Lernprozess (Stufe 5) und passen ihre Lernstrategie gegebenenfalls an (Stufe 6). Abschließend bewerten Lernende ihr Lernergebnis und setzen es mit ihrem Lernverhalten in Verbindung (Stufe 7). Der zyklische Zugang soll verdeutlichen, dass Lernprozesse kontinuierlich verbessert werden müssen, wozu Lernende ihre Erfahrungen in vorangegangenen Lernprozessen nutzen können. Da sich der Zyklus selbstregulierten Lernens von Ziegler und Stöger (2005) sowohl für die Analyse selbstregulierten Lernens als auch als Basis für die SRL-Förderung bei Grundschüler/-innen eignet, wurde dieses normative Modell in allen Studien der vorliegenden Arbeit verwendet.

1.2 Selbstreguliertes Lernen im Grundschulalter

Es ist mittlerweile Konsens, dass Schüler/-innen im Grundschulalter grundsätzlich in der Lage sind, ihr Lernen zumindest teilweise selbst zu regulieren (Artelt, 2006). Ein Überblick über Forschungsbefunde zu allen sieben Stufen des in Abschnitt 1.1 beschriebenen zyklischen SRL-Modells zeigte aber, dass Schüler/-innen im Laufe der Grundschulzeit zwar Fortschritte im SRL machen, dass gleichzeitig aber auf jeder Stufe noch Verbesserungsmöglichkeiten bestehen (Stöger, Sontag, & Ziegler, 2009). So werden Selbsteinschätzungen (Stufe 1) im Laufe der Grundschulzeit zwar realistischer, wobei jüngere Grundschulkinder zu Überschätzungen neigen und sich erst ältere Grundschulkinder realistischer einschätzen (z. B. Visé & Schneider, 2000). Allerdings gelingt auch am Ende der Grundschulzeit nicht allen Kindern eine realistische Selbsteinschätzung, wobei sowohl Über- als auch Unterschätzungen auftreten können (Tiedemann & Faber, 1994). Zu Zielsetzungen (Stufe 2) gibt es überraschenderweise kaum Studien mit Grundschulkindern. Eine Ausnahme bildet die Studie von White, Hohn und Tollefson (1997), die die Angemessenheit von Zielsetzungen mit Zweit- bis Fünftklässler/-innen untersuchten. Im Verlauf von vier Wochen lernten etwa zwei Drittel der Schüler/-innen, sich realistische Ziele in einem wöchentlichen Rechtschreibtest zu setzen, einem Drittel gelang das allerdings – unabhängig von der Klassenstufe – nicht. Kritisch anzumerken ist, dass in dieser Studie bei der Instruktion der Schüler/-innen nicht eindeutig zwischen Selbsteinschätzungen und Zielesetzen unterschieden wurde, so dass das Ergebnis mit Vorsicht interpretiert werden muss. Bei der strategischen Planung (Stufe 3) gelingt es Schüler/-innen im Laufe der Grundschulzeit zwar immer besser, angemessene Strategien auszuwählen, aber auch gegen Ende der Grundschulzeit fehlt den Schüler/-innen dazu noch Strategiewissen, das sie erst im Jugendalter erwerben (Artelt, 2006; Lockl, 2003). Eine ähnliche Entwicklung ist auch beim Strategieeinsatz (Stufe 4) zu beobachten. Kron-Sperl (2005) beobachtete zudem, dass Grundschüler/-innen ohne systematisches Training zwar Strategien einsetzen, diese aber oft unvollständig erwerben, sie zeitweise wieder aufgeben, und sie erst später plötzlich wiederentdecken. Zur Überwachung des Lernverhaltens (Stufe 5) sind zwar schon relativ junge Kinder in der Lage (Brown, 1984), allerdings überwachen Schüler/-innen ihr Lernverhalten bzw. ihren Strategieeinsatz ohne Aufforderung in der Regel nicht oder nur unzureichend (Bossert & Schwantes, 1995). Eine Strategieanpassung (Stufe 6) kann aber ohne adäquate Überwachung nicht erfolgen. Hinzu kommt, dass für eine gelungene Strategieanpassung in vielen Fällen auch Wissen oder Fähigkeiten notwendig sind, die Schüler/-innen im Grundschulalter erst noch erwerben müssen (Lockl, 2003). Nach dem Lernen sollten Schüler/-innen eine Verbindung zwischen dem Lernergebnis und ihrem Lernverhalten herstellen (Stufe 7), um ihre Erfahrungen für zukünftige Lernepisoden nutzen zu können. Ohne systematisches Training führen allerdings viele Schüler/-innen am Ende der Grundschulzeit das Lernergebnis stattdessen auf ihre Fähigkeit, auf die Aufgabenschwierigkeit oder auf Glück bzw. Pech zurück (Chan & Moore, 2006).

Da es beim SRL auch darum geht, dass Schüler/-innen zunehmend Verantwortung für ihr eigenes Lernen übernehmen, ist es wichtig, dass die Schüler/-innen neben Fähigkeiten auch die Bereitschaft entwickeln, beim Lernen tatsächlich selbstreguliert vorzugehen, anstatt sich auf andere

Personen wie Eltern oder Lehrkräfte zu verlassen, also external gesteuert zu lernen, oder überhaupt nicht über ihr Lernen nachzudenken, also impulsiv zu lernen (Ziegler, et al., 2010). Die bestehende Forschungsliteratur lieferte allerdings nur für einzelne Stufen des Lernzyklus Hinweise darauf, inwiefern dies bei Schüler/-innen am Ende der Grundschulzeit der Fall ist. Beispielsweise zeigten Bossert und Schwantes (1995), dass Viertklässler/-innen zwar prinzipiell in der Lage sind, ihr Lernverhalten beim Lesen zu überwachen, dass sie dies ohne Aufforderung aber nicht oder nur unzureichend tun. Ein aktueller Überblick über die Bereitschaft von Schüler/-innen, für die einzelnen SRL-Prozesse selbst Verantwortung zu übernehmen, erschien auch deshalb wünschenswert, weil sich ältere Befunde aufgrund von veränderten Rahmenbedingungen (z. B. aufgrund von veränderten Lehrplänen) möglicherweise nicht auf die heutige Situation übertragen lassen. Da laut neueren Lehrplänen von Kindern am Ende der Grundschulzeit zunehmend mehr Selbstständigkeit erwartet wird (z. B. Bayerisches Staatsministerium für Unterricht und Kultus, 2000, 2014) und da empirische Befunde auf Veränderungen beim SRL im Alter von etwa zehn Jahren hindeuten (Artelt, 2006; Bronson, 2000) erschien es angebracht, die Präferenz für SRL nicht nur punktuell, sondern im Verlauf des vierten Schuljahres zu untersuchen.

1.3 Die Förderung selbstregulierten Lernens im Grundschulalter

Ausgehend von der bisherigen Befundlage, erschien es sinnvoll und notwendig, Schüler/-innen im Grundschulalter dabei zu unterstützen, ihre Fähigkeiten im SRL zu verbessern und gleichzeitig darauf hinzuwirken, dass sie zunehmend SRL gegenüber anderen Lernzugängen bevorzugen. Metaanalysen zeigten zwar, dass SRL grundsätzlich bereits im Grundschulalter wirkungsvoll trainiert werden kann (z. B. Dignath & Büttner, 2008). Für den deutschen Sprachraum lagen bisher allerdings nur wenige empirisch überprüfte Konzepte zur Vermittlung von SRL an Grundschüler/innen vor (vgl. Hellmich & Wernke, 2009 für einen Überblick).

An den existierenden Interventionen ist zu kritisieren, dass häufig nur einzelne Aspekte von SRL eingeübt werden. Einzelne kognitive oder einzelne metakognitive Strategien zu trainieren, kann zwar auch positive Effekte auf Lernverhalten und Leistung haben, aber die Schüler/-innen werden so nicht dazu animiert, Verantwortung für den ganzen Lernprozess zu übernehmen, also tatsächlich selbstreguliert zu lernen. Um dies zu erreichen, erscheint es notwendig, die wichtigsten kognitiven und metakognitiven Strategien gleichzeitig und eingebettet in ein Modell selbstregulierten Lernens zu vermitteln. Allerdings ist zu bedenken, dass es dabei möglichweise zu *cognitive overload* (Chandler & Sweller, 1991) kommen könnte, die Schüler/-innen also von der kombinierten Vermittlung überfordert sind und somit nicht von ihr profitieren können.

Weiterhin ist zu kritisieren, dass viele der evaluierten SRL-Trainings außerhalb der regulären Unterrichtszeit von externen Kräften im Rahmen von Forschungsprojekten durchgeführt und bisher häufig mit mathematischen Inhalten kombiniert wurden. Zwar lassen sich auf diese Weise Effekte auf SRL leichter nachweisen als bei lehrergeleiteten Fördermaßnahmen und bei der Kombination mit anderen fachlichen Inhalten (Dignath & Büttner, 2008), aber wenn man SRL langfristig als präferierten Lernzugang etablieren will, ist es wichtig, dass SRL von Lehrkräften im regulären Unterricht vermittelt wird, und dass dies an verschiedenen fachlichen Inhalten geschieht: Auf diese Weise werden alle Schüler/-innen einer Klasse erreicht, auch diejenigen, die an außerunterrichtlichen Maßnahmen nicht teilnehmen würden. Des Weiteren erleben die Schüler/-innen SRL als unmittelbar relevant für ihren normalen Schulalltag. Schließlich bietet sich ihnen auf diese Weise auch ausreichend Gelegenheit, SRL einzuüben.

Zusammenfassend lässt sich sagen, dass bislang evaluierte Konzepte fehlten, in denen folgende Aspekte gleichzeitig berücksichtigt werden: Die wichtigsten SRL-Aspekte werden als Kombination metakognitiver und kognitiver Strategien eingebettet in ein zyklisches SRL-Modell vermittelt und systematisch eingeübt. Die Vermittlung von SRL erfolgt während der regulären Unterrichtszeit im Klassenverband durch Lehrkräfte. SRL wird an anderen als mathematischen Inhalten eingeübt.

Entscheidet man sich für die lehrergeleitete Vermittlung von SRL, sollte der Schulung und der Begleitung der Lehrkräfte ein besonderer Stellenwert zukommen. Außerdem erscheint es günstig, ein bereits ausgearbeitetes Trainingsprogramm zu verwenden, in dem theoretische Prinzipien bereits in konkrete Vorgehensweisen für den Unterricht übersetzt wurden. Stöger und Ziegler (2008b) haben ein Trainingsprogramm entwickelt, das sich aufgrund seines sozial-kognitiven Zugangs und seiner Kombination aus kognitiven (aufgabenbezogenen) und metakognitiven Strategien besonders gut für die Vermittlung von SRL bei Grundschüler/-innen eignet (Dignath & Büttner, 2008). Das siebenwöchige Training basiert auf dem Modell von Ziegler und Stöger (2005), wobei eine Besonderheit des Trainings darin besteht, dass die Schüler/-innen das Modell als „Lernkreis" explizit kennenlernen. In diesem Programm üben die Schüler/-innen SRL beim Bearbeiten von Sachtexten im Unterricht und während der Hausaufgaben ein. Dazu erlernen die Schüler/-innen neben metakognitiven Strategien auch drei kognitive Textreduktionsstrategien, die ihnen dabei helfen, die wichtigsten Aussagen aus Sachtexten herauszuarbeiten und darzustellen. Im Verlauf des Trainings prozeduralisieren die Schüler/-innen das gelernte Wissen anhand der Bearbeitung von insgesamt 25 kurzen Sachtexten. Da die Aufgaben von vergleichbarer Länge und Schwierigkeit sind, können die Schüler/-innen im Laufe des Trainings leicht ihre Fortschritte feststellen und auf ihr verbessertes Lernverhalten zurückführen. Auf diese Weise können sie erkennen, dass sich SRL lohnt und folglich eine Präferenz für diesen Lernzugang entwickeln.

Bislang war noch nicht untersucht worden, ob sich dieses Trainingsprogramm tatsächlich positiv auf die Präferenz für SRL und die Leistungen von Schüler/-innen am Ende der Grundschulzeit auswirkt, wenn es von Lehrkräften im Unterricht eingesetzt wird. Vor dem Hintergrund, dass die Kombination von kognitiven und metakognitiven Strategien bei einem komplexen Prozess wie dem Bearbeiten von Sachtexten zu *cognitive overload* (Chandler & Sweller, 1991) führen könnte, war es von Interesse nachzuweisen, dass das kombinierte Einüben kognitiver und metakognitiver Strategien nicht nur dem regulären Unterricht, sondern auch einem reinen Training kognitiver Strategien wirklich überlegen ist.

1.4 Selbstreguliertes Lernen bei hochintelligenten Schüler/-innen: Ausgangslage und Förderung

Nach wie vor steht die Annahme im Raum, hochintelligente Schüler/-innen würden gerne von sich aus selbstreguliert lernen, wüssten mehr über SRL und könnten es auch besser umsetzen als ihre durchschnittlich intelligenten Peers (Treffinger, 2009). Bisherige Befunde stützen diese Annahme aber nur teilweise (für einen Überblick vgl. Hoh, 2008; Sontag und Stöger, 2010; Veenman, 2008). So scheinen hochintelligente Schüler/-innen durchschnittlich zwar mehr metakognitives Wissen zu haben (Alexander, Carr, & Schwanenflugel, 1995), es aber nicht notwendigerweise zu nutzen, um ihren Lernprozess selbst zu regulieren. In einigen Studien setzten hochintelligente Schüler/-innen einzelne SRL-Strategien oder SRL-Teilprozesse zwar häufiger oder besser um als ihre durchschnittlich intelligenten Peers (z. B. Bouffard-Bouchard, Parent, & Larivée 1993; Zimmerman & Martinez-Pons, 1990), aber selbst in diesen Studien zeigten sich die Vorteile nicht bei allen Strategien und Teilprozessen. In anderen Studien setzten hochintelligente Schüler/-innen SRL-Strategien sogar weniger häufig ein als ihre Peers (z. B. Neber & Schommer-Aikens, 2002, in Bezug auf die Ergebnisse von Wolters & Pintrich, 1998).

Die uneinheitliche Befundlage lässt sich – zumindest in Teilen – auf verschiedene methodische Probleme zurückführen. Das Problem der Stichprobenselektivität tritt bei einem Großteil der bisherigen Studien auf: Die hochintelligenten Schüler/-innen, bei denen Vorteile im SRL festgestellt wurden, unterschieden sich nicht nur in ihrer Intelligenz von ihren durchschnittlich intelligenten Peers, sondern auch durch andere Merkmale, da sie etwa eine Schule für besonders begabte Schüler/-innen besuchten oder an einem Förderprogramm teilnahmen (Sontag & Stöger, 2010). Dieses Problem tritt auch deshalb so häufig auf, weil bisherige Studien mit hochintelligenten Schüler/-innen hauptsächlich in der Sekundarstufe durchgeführt wurden und in der Sekundarstufe viele hochintelligente Schüler/-innen in anderen Lernumwelten (Schulformen bzw. *tracks*) unterrichtet werden als ihre durchschnittlich und unterdurchschnittlich intelligenten Peers. Eine Untersuchung bei Grundschüler/-innen erschien deshalb aus zwei Gründen angebracht: Zum einen weiß man noch recht wenig darüber, inwiefern hochintelligente Grundschüler/-innen tatsächlich SRL als Lernzugang bevorzugen, und zum anderen könnte man das Problem der Stichprobenselektivität verringern, da in Grundschulen hochintelligente Kinder in der Regel gemeinsam mit ihren Peers unterrichtet werden.

Zur SRL-Förderung hochintelligenter Schüler/-innen liegen bisher kaum Studien vor, obwohl man nach derzeitiger Befundlage nicht davon ausgehen kann, dass hochintelligente Schüler/-innen ihr Lernen von sich aus optimal selbst regulieren, und man gleichzeitig aus der Expertiseforschung weiß, dass hochintelligente Personen spätestens dann selbstreguliert lernen müssen, wenn sie ihr besonderes Potential in außergewöhnliche Leistungen umsetzen möchten (Zimmerman, 2006). Da hochintelligente Grundschüler/-innen in der Regel gemeinsam mit ihren durchschnittlich intelligenten Peers in einer Klasse unterrichtet werden, stellt sich insbesondere die Frage, inwiefern sie von einer lehrergeleiteten SRL-Förderung im regulären Unterricht profitieren können. Auch hier steht nach wie vor die Befürchtung im Raum, hochintelligente Schüler/-innen könnten von einer derartigen Maßnahme nicht profitieren (Treffinger, 2009). Inwiefern diese Befürchtung zutrifft, wurde bisher nicht untersucht. Allerdings gibt es verschiedene Studien, die – zusammengenommen – darauf hinweisen, dass hochintelligente Grundschüler/-innen von einem SRL-Training im Klassenkontext ebenso profitieren könnten wie ihre Klassenkamerad/-innen: So profitieren hochintelligente Schüler/-innen vom Training kognitiver Strategien in Einzelsettings (z. B. Scruggs & Mastropieri, 1988) und vom Training kognitiver und metakognitiver Strategien in Kleingruppen mit anderen hochintelligenten Schüler/-innen (z. B. Schunk & Swartz, 1993). Zudem hatte ein SRL-Training, das mit mathematischen Inhalten im Klassekontext durchgeführt wurde, positive Wirkungen auf hochintelligente Underachiever (Stoeger & Ziegler, 2005) und auf Grundschüler/-innen mit unterschiedlichen kognitiven Fähigkeiten (Stoeger & Ziegler, 2010). Da die Gruppe der überdurchschnittlich intelligenten Schüler/-innen in den beiden Studien relativ breit definiert war, erschien es nach wie vor notwendig, eine enger definierte Spitzengruppe zu untersuchen.

1.5 Selbsteinschätzung und Zielesetzen als SRL-Teilprozesse bei Grundschüler/-innen

Langfristig ist es wünschenswert, nachweislich wirksame SRL-Trainingsprogramme weiter zu optimieren. Dies kann beispielsweise dadurch geschehen, dass neuere altersspezifische Erkenntnisse zu SRL am Ende der Grundschulzeit in den Trainingsprogrammen berücksichtigt werden. Allerdings gibt es diesbezüglich kaum empirische Befunde. So weiß man etwa immer noch wenig über die Gründe, warum Viertklässler/-innen einzelne SRL-Teilprozesse (Selbsteinschätzung, Zielesetzen, strategisches Planen, Strategieanwendung, Strategieüberwachung, Strategie-anpassung, Bewertung; Ziegler & Stöger, 2005) nicht optimal ausführen. Die vorliegende Arbeit trägt dazu bei, diese Lücke zu schließen, indem Gründe für fehlerhafte Selbsteinschätzungen und Zielsetzungen bei Viertklässler/-innen untersucht werden. Bei Selbsteinschätzung und Zielesetzen handelt es sich um die ersten beidem im normativen SRL-

Modell von Ziegler und Stöger (2005) beschriebenen Teilprozesse, die die Grundlage für alle weiteren Teilprozesse bildet.

1.5.1 Selbsteinschätzung vor dem Lernen

Vor dem Lernen bzw. dem Bearbeiten einer Aufgabe sollten Lernende ihre Kenntnisse und Fähigkeiten in Bezug auf die Aufgabe möglichst realistisch selbst einschätzen, damit sie sich anschließend ein angemessenes Ziel setzen und den weiteren Lernprozess strategisch planen können (Ziegler & Stöger, 2005). In der Realität kann es bei der Selbsteinschätzung zu Überschätzungen und Unterschätzungen kommen, wobei bei jungen Kindern in der Regel Überschätzungen zu beobachten sind und erst am Ende der Grundschulzeit bei einzelnen Schüler/-innen auch Unterschätzungen auftreten (Tiedemann & Faber, 1994). Diese Fehleinschätzungen können neben altersunabhängigen Gründen wie einem unklaren Bezugspunkt für die Einschätzung („gut im Vergleich zu was/wem?"), fehlender Vertrautheit mit einer Aufgabe oder unklaren Aufgabenanforderungen (Butler & Cartier, 2004; Cleary, 2009; Schunk & Pajares, 2002) auch altersspezifische Gründe haben, da Kinder je nach Alter zu bestimmten, für eine realistische Selbsteinschätzung notwendigen kognitiven Leistungen möglicherweise noch nicht in der Lage sind (Bronson, 2000; Schunk & Pajares, 2002). Unseres Wissens liegen bisher keine Studien zu möglichen altersspezifischen Gründen für Fehleinschätzungen bei Viertklässler/-innen, also bei Kindern im Alter von etwa zehn Jahren, vor. Studien mit jüngeren Kindern (Kindergartenalter bis 3. Klasse) (Schneider, 1998; Visé und Schneider, 2000) wiesen allerdings darauf hin, dass insbesondere zwei Gründe bei der Selbsteinschätzung im Schulalltag von Viertklässler/-innen eine Rolle spielen könnten: zum einen Gedächtnisdefizite beim Erinnern und Nutzen vorheriger Leistungen und zum anderen Wunschdenken. In den genannten Studien wurden diese Gründe experimentell anhand einfacher Gedächtnis- und psychomotorischer Aufgaben untersucht.

Bei der Gedächtnisdefizithypothese wird angenommen, dass Kinder sich nicht korrekt an ihre vergangenen Leistungen bei der gleichen Aufgabe erinnern können und/oder die Erinnerung an vergangene Leistungen nicht bei ihrer Selbsteinschätzung berücksichtigen (Parsons & Ruble, 1977; Shaklee & Tucker, 1979). Derartige Gedächtnisdefizite könnten sowohl Über- als auch Unterschätzungen erklären. Zur Untersuchung dieser Hypothese wurden in den Studien von Schneider (1998) und von Visé und Schneider (2000) Postdiktionen erhoben: Die Kinder wurden kurz nach der jeweiligen Aufgabenbearbeitung nach ihrer Leistung befragt. Alle Kinder konnten sich korrekt an ihre Leistungen erinnern. Ein Gedächtnisdefizit in Form eines Erinnerungsdefizits lag also in dieser Situation nicht vor. Da die Spanne zwischen Aufgabenbearbeitung und Abfrage der Erinnerung in diesen Studien sehr kurz war, lassen sich die Ergebnisse nicht ohne Weiteres auf längere Zeiträume zwischen zu bearbeiteten Aufgaben – wie sie in der Schule üblich sind – übertragen. Ob in einem schulnahen Setting Erinnerungsdefizite bei Kindern am Ende der Grundschulzeit auftreten und mit fehlerhafter Selbsteinschätzung im Zusammenhang stehen, muss also in einer eigenen Untersuchung geklärt werden. In den Studien von Schneider (1998) und Visé und Schneider (2000) blieb zudem die Frage offen, inwiefern die Kinder die vorhandenen Leistungsinformationen in ihre Selbsteinschätzungen einbeziehen; auch dieser Frage sollte also in einer eigenen Untersuchung nachgegangen werden.

Die Wunschdenkenshypothese besagt, dass Kinder möglicherweise noch nicht zwischen Selbsteinschätzung und Wünschen unterscheiden und es deshalb bei der Selbsteinschätzung zu Überschätzungen kommt (Dweck, 2002; Stipek, 1984). In den Studien von Schneider (1998) und von Visé und Schneider (2000) wurde diese Hypothese in einem *between-subject*-Design anhand einfacher Gedächtnis- und psychomotorischer Aufgaben überprüft. Bei jedem Durchgang wurden die Kinder in der Wunsch-Bedingung nach ihrem Wunsch für den nächsten Versuch gefragt, während die Kinder in der Selbsteinschätzungs-Bedingung um eine Selbsteinschätzung gebeten wurden. Tatsächlich zeigten sich bei den Kindergartenkindern in keiner der vier verwendeten Aufgaben Unterschiede zwischen den Bedingungen, und auch bei den ältesten untersuchten Kindern, den Drittklässler/-innen, unterschieden sich die Bedingungen nur in einer Aufgabe. Auch wenn das verwendete Design kritisiert werden kann, ist dieser Befund als Hinweis darauf zu werten, dass Schüler/-innen zumindest bis zur dritten Klasse Schwierigkeiten damit haben, zwischen Wünschen und Selbsteinschätzung zu unterscheiden. Inwiefern das auch bei Viertklässler/-innen der Fall ist, muss in einer eigenen Untersuchung geklärt werden, wobei ein *within-subject*-Design zur leichteren Interpretierbarkeit der Befunde gewählt werden sollte.

1.5.2 Zielesetzen

Aufbauend auf ihren Selbsteinschätzungen sollten Lernende realistische Ziele für ihr Lernen setzen, d. h. Ziele, die herausfordernd und gleichzeitig erreichbar sind (Locke & Latham, 1990, 2002; Zimmerman, 2008). In der Realität gelingt das auch erwachsenen Lernenden nicht immer: Sie wählen wenig herausfordernde Ziele oder unerreichbar hohe Ziele. Inwiefern Grundschüler/-innen realistische Zielsetzungen vornehmen, wurde trotz der unbestritten hohen pädagogischen Relevanz bisher kaum untersucht. Eine Ausnahme bildet die bereits in Abschnitt 1.2 erwähnte Studie von White et al. (1997), die die Angemessenheit von Zielsetzungen mit Zweit- bis Fünftklässler/-innen untersuchten. Die Autor/-innen fanden keine Jahrgangsstufen-Unterschiede und berichteten, dass etwa 2/3 der Schüler/-innen in der Lage waren, sich im Laufe von vier Wochen zunehmend realistischere Ziele in einem wöchentlichen Rechtschreibtest zu setzen – einem Drittel gelang dies aber auch zum Ende der Studie nicht. An dieser Studie ist zu kritisieren, dass bei der Instruktion der Kinder nicht eindeutig zwischen Selbsteinschätzungen und Zielesetzen unterschieden wurde, so dass sich das Ergebnis nicht eindeutig auf den Teilprozess Zielesetzen beziehen lässt.

Mögliche Gründe für unrealistische Zielsetzungen von Grundschulkindern wurden unseres Wissens bislang nicht untersucht. Aus der allgemeinen Zielsetzungsliteratur ist allerdings bekannt, dass es für eine realistische Zielsetzung wichtig ist, vergangene Leistungen miteinzubeziehen und Ziele von reinen Wünschen abzugrenzen (z. B. Oettingen & Stephens, 2009). Ähnlich wie bei der Selbsteinschätzung, könnten also auch bei der Zielsetzung Erinnerungsdefizite und die fehlende Unterscheidung zwischen Zielen und Wünschen Gründe für unrealistische Zielsetzungen bei Grundschüler/-innen sein. Dass für unrealistische Zielsetzungen ähnliche Gründe verantwortlich sein könnten wie für fehlerhafte Selbsteinschätzungen, wird zusätzlich durch eigene Forschungsbefunde aus Studien zum SRL im Grundschulalter gestützt. Hier zeigte sich nämlich, dass die meisten Schüler/-innen im Schulalltag keine bewusste Selbsteinschätzung vornehmen, bevor sie sich Ziele setzten (Sontag, Stoeger, & Harder, 2012), so dass Erinnerungsdefizite und Wunschdenken erst beim Zielesetzen zum Tragen kommen könnten.

2. Ziele und Forschungsfragen

Das übergreifende Ziel der Arbeit bestand darin, neue Erkenntnisse zu SRL bei Schüler/-innen am Ende der Grundschulzeit (d. h. in der vierten Jahrgangsstufe), zu gewinnen, um bestehende Forschungslücken zu schließen. Die Ziele und Forschungsfragen der einzelnen Studien wurden auf Basis des jeweils aktuellen Forschungsstands abgeleitet, wobei für die späteren Studien auch Erkenntnisse aus der eigenen Forschung berücksichtigt wurden. Insgesamt wurden die im Folgenden ausgeführten fünf Ziele verfolgt.

Da aktuelle Erkenntnisse darüber fehlten, inwiefern Schüler/-innen am Ende der Grundschulzeit (in der vierten Klasse) überhaupt SRL als Lernzugang bevorzugen, war das erste Ziel die Untersuchung der Ausgangslage: Es sollte untersucht werden, welchen von drei Lernzugängen (SRL, external gesteuertes Lernen oder impulsives Lernen; Ziegler, et al., 2010) Viertklässler/-innen präferieren, wenn sie nach dem aktuell gültigen Lehrplan unterrichtet und darüber hinaus nicht speziell in SRL geschult werden. Da aufgrund des Lehrplans und des Alters der Schüler/-innen im Verlauf des vierten Schuljahres mit Veränderungen bezüglich des präferierten Lernzugangs zu rechnen ist, sollte die Präferenz für einen Lernzugang nicht nur zu Beginn des Schuljahres (Ziel 1a), sondern auch im Verlauf des Schuljahres untersucht werden (Ziel 1b).

Die Untersuchung der Ausgangslage ergab, dass Schüler/-innen am Ende der Grundschulzeit noch nicht im gewünschten Maße selbstreguliert lernen. Eine gezielte SRL-Förderung im Unterricht umzusetzen, erschien deshalb notwendig und sinnvoll. Bisher mangelte es allerdings an evaluierten Programmen, in denen (a) die wichtigsten SRL-Aspekte gleichzeitig und eingebettet in ein zyklisches SRL-Modell eingeübt werden, die sich (b) für die lehrergeleitete Umsetzung im Klassenverband eignen und bei denen (c) SRL an nicht-mathematischen Inhalten eingeübt wird. Deshalb bestand das zweite Ziel darin, die Wirksamkeit einer derartigen Maßnahme am Ende der Grundschulzeit nachzuweisen. Anhand eines Trainings, in dem Schüler/-innen aufgabenspezifische kognitive Strategien (Textreduktionsstrategien) und metakognitive Strategien im Rahmen des zyklischen SRL-Modells von Ziegler und Stöger (2005) kennenlernen und anschließend beim Lesen und Bearbeiten von Sachtexten einüben, sollte zunächst gezeigt werden, dass die Präferenz für SRL bei Viertklässler/-innen durch eine gezielte, lehrergeleitete Maßnahme besser gefördert werden kann als im regulären Unterricht (Ziel 2a). Die kombinierte Vermittlung metakognitiver und kognitiver Strategien hatte sich in Metaanalysen zwar bereits als günstig für die Vermittlung von SRL an Grundschüler/-innen erwiesen; allerdings ist zu bedenken, dass die kombinierte Vermittlung metakognitiver und kognitiver Strategien bei komplexen Trainingsaufgaben zu *cognitive overload* (Chandler & Sweller, 1991) führen könnte. Da bisher Studien fehlten, in denen die Überlegenheit der kombinierten Vermittlung metakognitiver und kognitiver Strategien gegenüber der alleinigen Vermittlung kognitiver Strategien durch einen direkten Vergleich zweier lehrergeleiteter Trainings nachgewiesen wurde, sollte die Überlegenheit der kombinierten Vermittlung durch einen solchen direkten Vergleich gezeigt werden, und zwar sowohl hinsichtlich der Präferenz für SRL (Ziel 2b) als auch hinsichtlich der Leistung in der Trainingsaufgabe (Ziel 2c).

Das dritte Ziel bestand darin, die Präferenz für SRL bei hochintelligenten Grundschüler/-innen zu untersuchen. Dies erschien notwendig, da in der Literatur nach wie vor die Annahme anzutreffen ist, hochintelligente Schüler/-innen würden sich bezüglich SRL von ihren Peers unterscheiden: Es wird angenommen, dass sie SRL gegenüber anderen Lernzugängen bevorzugen und dass sie auch eher als ihre Peers von sich aus selbstreguliert lernen wollen (Treffinger, 2009). Da aufgrund verschiedener methodischer Unzulänglichkeiten der bislang vorliegenden Studien nicht geklärt werden konnte, ob dies tatsächlich der Fall ist, wurde angestrebt, zu untersuchen, inwiefern hochintelligente Grundschüler/-innen SRL gegenüber anderen Lernzugängen bevorzugen (Ziel 3a) und ob sie sich bezüglich ihrer Präferenz für SRL von ihren Peers unterscheiden (Ziel 3b). Da denkbar ist, dass sich die Präferenz für SRL bei intelligenteren Kindern im Verlauf der vierten Klasse – also in einer Zeit, in der auch laut Lehrplan von den Schüler/-innen SRL zunehmend erwartet wird – stärker entwickelt als bei ihren Peers, sollte auch diese Vermutung empirisch geprüft werden (Ziel 3c)

Die Studie zur Erreichung von Ziel 3 zeigte, dass sich hochintelligente Grundschüler/-innen bezüglich ihrer Präferenz für SRL nicht von ihren durchschnittlich intelligenten Peers unterscheiden, und dass die Entwicklung der Präferenz für SRL nicht mit der Intelligenz der Schüler/-innen zusammenhängt. SRL gezielt zu fördern, erschien deshalb bei hochintelligenten Grundschüler/-innen genauso notwendig zu sein wie bei ihren durchschnittlich intelligenten Peers. Eine Literaturanalyse ergab, dass bisher keine Studien vorlagen, in denen gezeigt wurde, dass hochintelligente Schüler/-innen von lehrergeleiteten SRL-Fördermaßnahmen während des regulären Unterrichts profitierten. Gleichzeitig erbrachte die Literaturanalyse Hinweise, dass dies sehr gut möglich sei. Deshalb wurde als viertes Ziel angestrebt, zu zeigen, dass hochintelligente Schüler/-innen ebenso von einem lehrergeleiteten SRL-Training im regulären Unterricht profitieren wie ihre durchschnittlich intelligenten Mitschüler/-innen, und zwar sowohl bezüglich der Präferenz für SRL (Ziel 4a) als auch bezüglich der Trainingsleistungen (Ziel 4b). Da nahezu alle hochintelligenten Grundschüler/-innen in Deutschland in regulären Klassen gemeinsam mit ihren durchschnittlich intelligenten Peers unterrichtet werden, ist diese Untersuchung auch von hoher praktischer Relevanz.

Die Ergebnisse der Studien zur Erreichung der Ziele 1-4 zeigten, dass die Förderung von SRL bei Schüler/-innen am Ende der Grundschulzeit unabhängig von der Intelligenz der Schüler/-innen notwendig ist, und dass die Förderung über eine in den normalen Unterricht integrierte, lehrergeleitete Maßnahme wirksam erfolgen kann. Auch wenn die erreichten Effektstärken für eine lehrergeleitete SRL-Fördermaßnahme im Klassenverband als hoch eingeschätzt werden können, reichen sie nicht an Effektstärken heran, die in forschergeleiteten Maßnahmen mit Kleingruppen zu finden sind. Eine Möglichkeit, die Wirksamkeit der Maßnahme noch weiter zu verbessern, ohne auf die lehrergeleitete Umsetzung im Klassenverband zu verzichten, besteht darin, bei der Vermittlung noch stärker die spezifischen Schwierigkeiten von Viertklässler/-innen zu berücksichtigen. Dazu ist es allerdings auch notwendig, noch besser als bisher zu verstehen, aus welchen Gründen die Lernenden Schwierigkeiten mit den einzelnen SRL-Teilprozessen haben. Für die vorliegende Arbeit sollten derartige Erkenntnisse exemplarisch für „Selbsteinschätzung“ und „Ziele setzen“ gewonnen werden. Diese beiden Prozesse wurden ausgewählt, da sie zu Beginn eines Lernzyklus ausgeführt werden und damit auch die Grundlage für alle nachfolgenden Teilprozesse bilden (Ziegler und Stöger, 2005). Eine Literaturanalyse ergab, dass die Gründe für ungenaue Selbsteinschätzungen und unrealistische Zielsetzungen bei Schüler/-innen am Ende der Grundschulzeit bislang noch nicht untersucht worden waren. Deshalb bestand das fünfte Ziel darin, mögliche Gründe für ungenaue Selbsteinschätzungen und unrealistische Zielsetzungen bei Schüler/-innen am Ender der Grundschulzeit zu untersuchen. Da sich in experimentellen Studien mit jüngeren Kindern Hinweise fanden, dass möglicherweise Gedächtnisdefizite bei der Erinnerung vergangener Leistungen (Parsons & Ruble, 1977; Shaklee & Tucker, 1979; Visé & Schneider, 2000) und/oder Wunschdenken (Dweck, 2002; Stipek, 1984; Visé & Schneider, 2000) eine Rolle spielen könnten, sollte sowohl die Gedächtnisdefizithypothese (Ziel 5a) als auch die Wunschdenkenshypothese (Ziel 5b) untersucht werden. Die Studie sollte möglichst so angelegt sein, dass die Ergebnisse leicht für die schulische SRL-Förderung im Klassenverband genutzt werden können.

3. Überblick über die Artikel der vorliegenden Arbeit

Im Folgenden werden die vier Artikel vorgestellt, die in die kumulative Dissertation einfließen. Die Erkenntnisse aus diesen Artikeln tragen gemeinsam dazu bei, Forschungslücken im Bereich SRL am Ende der Grundschulzeit zu schließen. Da die Artikel inhaltlich stark zusammenhängen, in ihnen aber jeweils eigenständige Studien beschrieben werden, waren in diesem Überblick kleinere Wiederholungen nicht zu vermeiden.

3.1 Der Zusammenhang zwischen Intelligenz und der Präferenz für SRL: Eine Längsschnittstudie mit Viertklässler/-innen (Artikel 1)

Sontag, C., Stoeger, H. & Harder, B. (2012). The relationship between intelligence and the preference for self-regulated learning: A longitudinal study with fourth-graders. *Talent Development and Excellence, 4*, 1-22.

Die in diesem Artikel beschriebene Längsschnittstudie wurde durchgeführt, um aktuelle Erkenntnisse darüber zu erlangen, welchen Lernzugang (SRL, external gesteuertes Lernen oder impulsives Lernen; Ziegler et al., 2010) Schüler/-innen am Ende der Grundschulzeit bevorzugen, wenn sie nach aktuellem Lehrplan unterrichtet werden und darüber hinaus keine spezielle SRL-Förderung erhalten (Untersuchung der Ausgangslage, Ziel 1). Da aufgrund des Lehrplans und des Alters der Schüler/-innen im Verlauf des vierten Schuljahres mit Veränderungen bezüglich des präferierten Lernzugangs zu rechnen ist, wurde die Präferenz für einen Lernzugang nicht nur zu Beginn des Schuljahres (Ziel 1a), sondern auch im Verlauf des Schuljahres untersucht (Ziel 1b). Ein Schwerpunkt der Studie lag auf der Untersuchung eines möglichen Zusammenhangs zwischen Intelligenz und der Präferenz für SRL sowie auf der Untersuchung möglicher Unterschiede in der Präferenz für SRL bei hochintelligenten Schüler/-innen und ihren durchschnittlich intelligenten Peers (Ziel 3), da die Annahme, hochintelligente Schüler/-innen würden SRL als Lernzugang bevorzugen, nach wie vor weit verbreitet ist (Treffinger, 2009), man aber aufgrund methodischer Mängel bisheriger Studien nicht entscheiden kann, inwiefern dies tatsächlich der Fall ist. Insbesondere wurde untersucht, ob hochintelligente Schüler/-innen SRL gegenüber anderen Lernzugängen präferieren (Ziel 3a), ob hochintelligente Schüler/-innen SRL mehr als ihre durchschnittlich intelligenten Peers präferieren (Ziel 3b), und ob sich die Präferenz für SRL bei intelligenteren Schüler/-innen im Verlauf der vierten Klasse – also in einer Zeit, in der auch laut Lehrplan von den Schüler/-innen SRL zunehmend erwartet wird – stärker entwickelt als bei ihren Peers (Ziel 3c).

An der Längsschnittstudie mit drei Messzeitpunkten nahmen 368 Schüler/-innen aus 19 regulären vierten Klassen teil. Die Schüler/-innen füllten zu Beginn des Schuljahres, nach elf Wochen und nach weiteren zehn Wochen den Fragebogen FSL-7 (Ziegler, et al. 2010) aus. Mit diesem Instrument kann theoriebasiert (Ziegler & Stöger, 2005) und ökonomisch erfasst werden, welchen Lernzugang Grundschüler/-innen in schulischen Situationen präferieren: SRL, external gesteuertes Lernen oder impulsives Lernen. Beim SRL übernehmen die Schüler/-innen Verantwortung für ihren eigenen Lernprozess, beim external regulierten Lernen liegt die Verantwortung bei Eltern oder Lehrkräften, und beim impulsiven Lernen denken die Lernenden nicht über den eigenen Lernprozess nach. Die Schüler/-innen werden im FSL-7 gebeten, in vier schulrelevanten Situationen für alle sieben Stufen des Zyklus selbstregulierten Lernens von Ziegler und Stöger (2005) anzugeben, welchen der drei Lernzugänge sie präferieren. Beispielweise werden die Schüler/-innen in Situation 1 (Lernen für die Schule) bei Zyklusstufe 2 (Zielesetzen) gefragt: „Wie lernst du für die Schule?“ und wählen anschließend eine der drei Antwortalternativen aus: a) Ich setze mir ein bestimmtes Ziel, was und wieviel ich lernen möchte [SRL], b) Der Lehrer oder meine Eltern sollen mir sagen, welches Ziel ich mir setzen sollte [external gesteuertes Lernen], c) Wenn ich lerne, setze ich mir kein bestimmtes Ziel. Ich kann mich da auf mein Gefühl verlassen [impulsives Lernverhalten]. Da alle sieben Zyklusstufen in vier Situationen abgefragt werden, ermöglicht der Fragebogen neben der Untersuchung der allgemeinen Präferenz für SRL auch die Analyse der einzelnen SRL-Teilprozesse (Selbsteinschätzung, Zielesetzen, strategisches Planen, Strategieanwendung, Strategieüberwachung, Strategieanpassung, Bewertung).

Die Intelligenz der Schüler/-innen sowie demografische Daten wurden zu Beginn des Schuljahres erfasst. Zur Messung der Intelligenz wurde eine deutsche Ausgabe von Ravens *Standard Progressive Matrices* verwendet (Heller, Kratzmeier & Lengfelder, 1998). Dieser nonverbale Intelligenztest erfasst Intelligenz im Sinne von Spearman’s g-Factor (Spearman, 1904), d. h. einer allgemeinen kognitiven Fähigkeit, die für die Bewältigung vieler verschiedener kognitiver Aufgaben relevant ist. Der Test eignet sich für Gruppentestungen und erlaubt eine vergleichsweise wenig verzerrte Messung von Intelligenz bei Schüler/-innen mit nichtdeutscher Muttersprache.

Die Datenerhebung erfolgte durch geschulte Hilfskräfte oder durch die ebenfalls geschulten Klassenlehrkräfte. Sie fand während der regulären Unterrichtszeit im Klassenverband statt. Die Instruktionen, Situationsbeschreibungen und Antwortalternativen des FSL-7 wurden laut vorgelesen, um vergleichbare Bedingungen in allen Klassen zu gewährleisten und gleichzeitig allen Schüler/-innen (insbesondere leseschwachen Schüler/-innen) die zügige und korrekte Bearbeitung des Fragebogens zu ermöglichen. Die Instruktionen zu *Raven's Progressive Matrices* wurden ebenfalls wörtlich vorgelesen.

Für die Beschreibung der Ausgangslage zum ersten Messzeitpunkt wurden deskriptive Statistiken für die Gesamtstichprobe und getrennt für hochintelligente und durchschnittlich intelligente Schüler/-innen berechnet, wobei sowohl der gesamte Lernprozess als auch alle im Modell von Ziegler und Stöger (2005) beschriebenen Teilprozesse einzeln betrachtet wurden. Zu Beginn des vierten Schuljahres wurde keiner der drei Lernzugänge klar bevorzugt. Insgesamt wählten die untersuchten Viertklässler/-innen in einem Drittel (33 %) aller möglichen Fälle SRL als bevorzugten Lernzugang (Ergebnis zu Ziel 1a), wobei die SRL-Wahlen für die einzelnen Stufen zwischen 26 % (Strategieüberwachung) und 42 % (Selbsteinschätzung) schwankten. Hochintelligente Schüler/-innen präferierten SRL in 30 % der Fälle (Ergebnis zu Ziel 3a), und die Werte für die einzelnen Stufen schwankten zwischen 18 % (Strategieüberwachung) und 42 % (Selbsteinschätzung). T-Tests ergaben keine Unterschiede zwischen hoch- und durchschnittlich intelligenten Schüler/-innen, weder in der Präferenz für SRL insgesamt noch für eine der sieben Stufen (Ergebnis zu Ziel 3b). Zusätzlich wurde auch der Zusammenhang zwischen Intelligenz und der Präferenz für SRL untersucht. Da die Daten in intakten Klassen erhoben worden waren, wurden zusätzlich zu einfachen Korrelationsanalysen auch HLM-Analysen durchgeführt, um der hierarchischen Struktur der Daten (Schüler/-innen in Klassen) Rechnung zu tragen (Raudenbush & Bryk, 2002; Snijders & Bosker, 2003). Die Analysen ergaben keine Zusammenhänge zwischen Intelligenz und der Präferenz für SRL. Auch dieses Ergebnis gilt sowohl für die Präferenz für SRL insgesamt als auch für alle sieben Stufen des Zyklus selbstregulierten Lernens (Ziegler & Stöger, 2005).

Die Untersuchung der Veränderungen der Präferenz für SRL im Verlauf des Schuljahres, erfolgte ebenfalls mithilfe hierarchisch-linearer Modelle (HLM). Es wurden Wachstumskurven mit linearer und quadratischer Steigung modelliert mit Messzeitpunkten als *within-subject*-Variablen auf Ebene 1, Schülervariablen auf Ebene 2 und Klassenzugehörigkeit auf Ebene 3. Auf diese Weise kann neben der Art des Verlaufs (linear, quadratisch) auch analysiert werden, welcher Anteil der Varianz auf die Schülerebene und welcher Anteil auf die Klassenebene entfällt. Im Laufe des Schuljahres veränderte sich die Präferenz für SRL wenig: Insgesamt entschieden sich die Schüler/-innen zu allen Messzeitpunkten in etwa einem Drittel der möglichen Fälle für SRL (33 % zu MZP 1, 35 % zu MZP 2, 33 % zu MZP 3) (Ergebnis zu Ziel 1b). Die HLM-Analysen ergaben weder für SRL insgesamt noch für einzelne Stufen lineare Anstiege. Bei der Präferenz für SRL insgesamt sowie bei den Teilprozessen „Selbsteinschätzung“ und „Zielesetzen“ zeigten sich quadratische Verläufe mit einem leichten Anstieg zum zweiten Messzeitpunkt und einem leichten Abfall zum dritten Messzeitpunkt. Varianz auf Schülerebene beobachteten wir lediglich in den Verläufen für die Präferenz für SRL insgesamt sowie für die Teilprozesse „Selbsteinschätzung“ und „Strategieanwendung“. Diese wurden aber nicht durch die Schülervariable Intelligenz erklärt. Die Veränderung der Präferenz für SRL über das Schuljahr hinweg hing somit nicht mit der Intelligenz der Schüler/-innen zusammen (Ergebnis zu Ziel 3c). Die HLM-Analysen zeigten zudem deutlich, dass sich die Präferenz für SRL in unterschiedlichen Klassen im Laufe des vierten Schuljahres unterschiedlich entwickelte.

3.2 Wirkung eines lehrergeleiteten Trainings auf die Präferenz für selbstreguliertes Lernen, das Finden von Hauptgedanken in Sachtexten und Textverständnis (Artikel 2)

Stoeger, H., Sontag, C., & Ziegler, A. (2014). Impact of a teacher-led intervention on preference for self-regulated learning, finding main ideas in expository texts, and reading comprehension. *Journal of Educational Psychology 106*, 799–814. doi:10.1037/a0036035

Nachdem die Untersuchung der Ausgangslage in Artikel 1 ergeben hatte, dass SRL bei Schüler/-innen am Ende der Grundschulzeit im regulären Unterricht nicht ausreichend gefördert wird, wurde in einem zweiten Schritt die Wirkung einer lehrergeleiteten SRL-Fördermaßnahme für Schüler/-innen am Ende der Grundschulzeit untersucht. Das Training wurde in zwei Fächern (Deutsch und Heimat- und Sachunterricht) und in zwei verschiedenen Settings (im Klassenverbund während des Unterrichts und bei den Hausaufgaben) durchgeführt. In zwei Einführungswochen lernten die Schüler/-innen alle Schritte des zyklischen SRL-Modells von Ziegler und Stöger (2005) als „Lernkreis" kennen, erfuhren wie man Hauptaussagen in Sachtexten identifiziert und lernten drei (kognitive) Textreduktionsstrategien kennen, die für die Identifikation und Darstellung von Hauptaussagen in Sachtexten hilfreich sind. Anschließend übten die Schüler/-innen die kognitiven und metakognitiven Strategien eingebettet in das zyklische SRL-Modell über mehrere Wochen hinweg ein.

Wir nahmen an, dass durch diese Maßnahme die Präferenz für SRL bei Viertklässler/-innen besser gefördert wird als im regulären Unterricht (vgl. Ziel 2a). Zudem nahmen wir an, dass sich die Vorteile des Trainings nicht nur im Vergleich zum regulären Unterricht zeigen würden, sondern auch im Vergleich mit einem Training, in dem die Schüler/-innen nur die kognitiven Textreduktionsstrategien zum Identifizieren von Hauptaussagen kennenlernten und einübten, nicht aber den Lernkreis mit den metakognitiven Aspekten selbstregulierten Lernens. Wir nahmen an, dass sich die Überlegenheit des kombinierten Trainings im Vergleich mit dem reinen Textstrategie-training nicht nur bei der Präferenz für SRL zeigen würde (vgl. Ziel 2b), sondern auch bei den Leistungen in der Trainingsaufgabe (vgl. Ziel 2c). Zusätzlich erwarteten wir eine schwache bis moderate Transferwirkung auf das allgemeine Leseverständnis, da im verwendeten SRL-Trainingsprogramm durch das Einüben der Textreduktionsstrategien lediglich einer von vielen wichtigen Leseverständnis-Aspekten trainiert wurde. Wir erwarteten, dass sich die Transferwirkung sowohl im Vergleich zum regulären Unterricht als auch im Vergleich zum reinen Textstrategietraining zeigen würde.

Insgesamt nahmen 763 Schüler/-innen aus 33 vierten Klassen an der Studie teil. Um unsere Annahmen zu überprüfen, wurden drei Bedingungen miteinander verglichen: Schüler/-innen, die aufgabenspezifische Textreduktionsstrategien im Rahmen des gesamten Zyklus selbstregulierten Lernens (Ziegler & Stöger, 2005) einübten (SRL+TXT; 229 Schüler/-innen aus 9 Klassen), mit Schüler/-innen, die an einem reinen Textreduktionsstrategietraining (TXT; 268 Schüler/-innen aus 12 Klassen) und mit Schüler/-innen, die am regulärem Unterricht teilnahmen (REG; 266 Schüler/-innen aus 12 Klassen). Die Klassen wurden den drei Bedingungen zufällig zugeordnet, mit der Restriktion, dass Lehrkräfte von einer Schule nicht in unterschiedlichen Trainingsbedingungen sein konnten. Es handelt sich um eine quasi-experimentelle Studie, da wir mit intakten Klassen arbeiteten und nicht einzelne Schüler/-innen zufällig den Bedingungen zuordnen konnten (Gliner, Morgan, & Leech, 2009).

Da lehrergeleitete SRL-Trainings im Vergleich zu forschergeleiteten SRL-Trainings geringere Effektstärken aufweisen (Dignath & Büttner, 2008), lag ein Schwerpunkt bei der Durchführung der Studie auf der Schulung und Begleitung der Lehrkräfte. Die Lehrkräfte der beiden Trainingsbedingungen (SRL+TXT und TXT) nahmen jeweils an ausführlichen Schulungen teil, in der zuerst die theoretischen Grundlagen vermittelt wurden und anschließend die Umsetzung des Trainings im Unterricht besprochen wurde. Die Schulung dauerte zwei Tage für die Lehrkräfte der SRL+TXT-Gruppe und einen Tag für die Lehrkräfte in der TXT-Gruppe, da in der TXT-Gruppe auf SRL-Inhalte komplett verzichtet wurde. Alle Lehrkräfte erhielten die jeweiligen Trainingsmaterialien für die Schüler/-innen, ein Lehrermanual, in der die Inhalte der jeweiligen Schulung zusammengefasst waren, und Checklisten für jeden Tag des durchzuführenden Trainingsprogramms. Während des Trainings wurden die Lehrkräfte per E-Mail und Telefon begleitet. Außerdem wurde etwa zur Hälfte des Trainings ein Zwischentreffen veranstaltet, bei dem sich jeweils die Lehrkräfte der gleichen Trainingsbedingung untereinander und mit den Expertinnen der Universität Regensburg austauschen konnten. Da die Durchführung der Datenerhebung für die Evaluation durch die Lehrkräfte erfolgte, wurden die Lehrkräfte in allen drei Bedingungen in der Anwendung der Instrumente geschult. Die Lehrkräfte nutzten zur Durchführung standardisierte Anweisungen mit wörtlichen Instruktionen.

Die Studie beinhaltete sowohl eine summative Evaluation als auch eine Prozessevaluation. Im Rahmen der summativen Evaluation wurden zwei abhängige Variablen (Präferenz für SRL; allgemeines Leseverständnis) zu drei Messzeitpunkten untersucht (Prä-Test in der Woche vor dem Training, Post-Test in der Woche nach dem Training, Follow-up-Test elf Wochen nach dem Training). Auf diese Weise konnte sowohl die kurzfristige als auch die längerfristige Wirkung des Trainings untersucht werden. Die Präferenz für SRL wurde analog zu Artikel 1 mit dem FSL-7 (Ziegler et al., 2010) erfasst. Das allgemeine Leseverständnis wurde über standardisierte Lesetests (ELFE, Lenhard & Schneider, 2006; HAMLET, Lehmann, Peek & Poerschke, 2006) erhoben, um einen möglichen Transfer über das Training hinaus zu untersuchen. Zusätzlich zu den abhängigen Variablen wurden über einen Fragebogen zu Beginn des Trainings auch demografische Daten der Schüler/-innen erfasst, insbesondere Alter, Geschlecht und Migrationshintergrund.

Im Rahmen der Prozessevaluation wurde untersucht, inwiefern sich die Schüler/-innen der beiden Trainingsgruppen im Laufe des Trainings in der Trainingsaufgabe verbesserten. Die Schüler/-innen bearbeiteten an 25 Trainingstagen eine strukturgleiche und bezüglich der Schwierigkeit vergleichbare Aufgabe, bei der sie jeweils zehn Hauptaussagen in einem kurzen Sachtext identifizieren sollten. Die Leistungen bei dieser Aufgabe bildeten die Grundlage für die Prozessevaluation, in der der Fortschritt über die fünf Trainingswochen hinweg untersucht wurde.

Aufgrund der hierarchischen Datenstruktur erfolgte die Auswertung mithilfe hierarchisch-linearer Modelle (HLM) (Raudenbush & Bryk, 2002; Snijders & Bosker, 2003). Die summative Evaluation wurde mit getrennten 2-Ebenen-Modellen zum Post-Test und zum Follow-up-Test ausgewertet. Vortestwerte in der Präferenz für SRL und im Leseverständnis, Alter, Geschlecht und Migrationshintergrund wurden als Individualvariablen auf Ebene 1 modelliert, die Zugehörigkeit zu einer bestimmten Trainingsbedingung als Klassenvariable auf Ebene 2. Viertklässler/-innen, die SRL zusammen mit Textreduktionsstrategien bei der Bearbeitung von Sachtexten trainierten (SRL+TXT; Stöger & Ziegler, 2008b) zeigten sowohl zum Post-Test als auch zum Follow-up-Test eine höhere Präferenz für SRL als Schüler/-innen, die den regulären Unterricht besuchten (REG) (Ergebnis zu Ziel 2a) und als Schüler/-innen, die anhand der gleichen Aufgaben lediglich Textreduktionsstrategien einübten (TXT) (Ergebnis zu Ziel 2b). Der Effekt war elf Wochen nach dem Training größer als unmittelbar nach dem Training. Da sich die Klassen unserer Stichprobe stark in ihrem Anteil an Kindern mit Migrationshintergrund unterschieden, berechneten wir zusätzliche Modelle, in denen der Anteil an Kindern mit Migrationshintergrund in den Klassen statistisch kontrolliert wurde. In diesen Modellen zeigte sich der Trainingseffekt bezüglich der Präferenz für SRL sowohl unmittelbar nach dem Training als auch elf Wochen nach dem Training noch deutlicher. Die Trainingswirkung auf das Textverständnis in einem standardisierten Lesetest (Transfer) zeigte sich teilweise: Nur wenn der Anteil an Kindern mit Migrationshintergrund in den Klassen statistisch kontrolliert wurde, erzielten die Schüler/-innen der SRL+TXT-Gruppe unmittelbar nach dem Training bessere Leistungen als Schüler/-innen der beiden anderen Gruppen. Zum Follow-up verringerte sich der Effekt, blieb aber als Trend sichtbar.

Für die Prozessevaluation wurden Wachstumskurven über die fünf Trainingswochen modelliert, wobei die fünf Messzeitpunkte als *within-subject* Variable auf Ebene 1 berücksichtigt wurden, Schülervariablen auf Ebene 2 und Klassenvariablen auf Ebene 3. Schüler/-innen in beiden Trainingsgruppen verbesserten sich im Laufe des Trainings in der Trainingsaufgabe. Der Zuwachs an richtig identifizierten Hauptaussagen im Trainingsverlauf war bei Schüler/-innen, die am kombinierten Training teilnahmen (SRL+TXT), größer als bei Schüler/-innen, die am reinen Textstrategie-training teilnahmen (TEXT) (Ergebnis zu Ziel 2c). Nahezu 50 % der Varianz in den Zuwächsen zwischen den Klassen wurde durch die Zugehörigkeit zu den unterschiedlichen Trainingsbedingungen erklärt.

Insgesamt zeigen die in Artikel 2 berichteten Ergebnisse, dass SRL bei Schüler/-innen am Ende der Grundschulzeit durch eine lehrergeleitete Maßnahme im Klassenverband erfolgreich gefördert werden kann. Dabei schnitt das Training, in dem metakognitive und kognitive Strategien in Kombination eingeübt wurden, erfolgreicher ab als ein reines Training aufgabenspezifischer kognitiver Strategien.

3.3 Können hochintelligente und hochleistende Schüler/-innen von einem Training selbstregulierten Lernens in regulären Klassen profitieren? (Artikel 3)

Sontag, C., & Stoeger, H. (2015). Can highly intelligent and high-achieving students benefit from training in self-regulated learning in a regular classroom context? *Learning and Individual Differences, 41,* 43–53. doi:10.1016/j.lindif.2015.07.008

In Artikel 1 hatten wir festgestellt, dass hochintelligente Schüler/-innen am Ende der Grundschulzeit SRL nicht als Lernzugang gegenüber anderen Lernzugängen bevorzugen, und sich damit nicht von ihren durchschnittlich intelligenten Peers unterscheiden. In Artikel 2 hatten wir gezeigt, dass SRL bei Schüler/-innen am Ende der Grundschulzeit erfolgreich durch ein lehrergeleitetes Training im Klassenverband gefördert werden kann. Da eine gezielte SRL-Förderung auch für hochintelligente Schüler/-innen notwendig ist, hochintelligente Grundschüler/-innen in aller Regel gemeinsam mit ihren durchschnittlich intelligenten Peers unterrichtet werden, und keine Befunde vorlagen, ob hochintelligente Schüler/-innen (Top 10 % in einem Intelligenztest, vgl. Gagné, 2004) von einem lehrergeleiteten SRL-Training in heterogenen Schulklassen ebenso profitieren wie ihre Peers mit durchschnittlicher Intelligenz, wurde diese Fragestellung in Artikel 3 untersucht. Zusätzlich wurden dieselbe Fragestellung auch für hochleistende Schüler/-innen (Top 10 % in Bezug auf Zeugnisnoten im Vorjahr; vgl. Ee, Moore, & Atputhasamy, 2003) untersucht, da ebenso wie bei hochintelligenten Schüler/-innen die Annahme besteht, sie würden von sich aus selbstreguliert lernen und deshalb von einem SRL-Training nicht profitieren (Treffinger, 2009).

Um die Fragen zu beantworten, wurde ein Teildatensatz aus der in Artikel 2 beschriebenen Studie analysiert. Es wurden zwei Gruppen miteinander verglichen: 123 Schüler/-innen, die an einem Training zu SRL beim Bearbeiten von Sachtexten teilnahmen (SRL) mit 199 Schüler/-innen, die am regulären Unterricht teilnahmen (REG). Bei der Stichprobe handelt es sich um eine Teilstichprobe aus der in Artikel 2 beschriebenen Evaluationsstudie, bei der wir in ergänzenden Analysen differenzielle Effekte für Schüler/-innen mit und ohne Migrationshintergrund gefunden hatten. Aufgrund dieser differenziellen Effekte und um das Manuskript lesbar zu halten, entschlossen wir uns, in der vorliegenden Studie nur Schüler/-innen ohne Migrationshintergrund zu untersuchen.

Die differentielle Wirksamkeit für hochintelligente Schüler/-innen und für hochleistende Schüler/-innen wurde in der vorliegenden Studie für zwei abhängige Variablen untersucht. Die Präferenz für SRL wurde zu drei Messzeitpunkten gemessen (Prä-Test in der Woche vor dem Training, Post-Test in der Woche nach dem Training, Follow-up-Test elf Wochen nach dem Training); die Leistung in der Trainingsaufgabe (Identifizieren von Hauptaussagen in einem Sachtext) lag für die 25 Texte vor, die die Schüler/-innen im Rahmen der Übungsphase des Trainings bearbeitet hatten.

Da es sich bei dieser Studie um eine weitere Analyse des Datensatzes der in Artikel 2 beschriebenen Evaluationsstudie handelt, sind sowohl die Durchführung des Trainings, als auch die Erhebung der abhängigen Variablen und der demografischen Daten identisch. Für die vorliegende Studie wurden zusätzlich Intelligenz und Schulleistung als unabhängige Variablen für die differenziellen Analysen erhoben. Zur Messung der allgemeinen Intelligenz wurde, wie bereits in Artikel 1, ein nonverbaler Intelligenztest eingesetzt (Horn, 2009). Die Durchführung des Tests erfolgte durch die Lehrkräfte, die zu diesem Zweck geschult worden waren und eine Anleitung mit wörtlich vorzulesenden Instruktionen erhalten hatten. Als Maß für die Schulleistung wurden die Noten im Jahreszeugnis der dritten Jahrgangsstufe in den drei Hauptfächern (Deutsch, Mathematik, Heimat- und Sachunterricht) von den Klassenlehrkräften erfragt.

Aufgrund der im Vergleich zu Artikel 2 kleineren Stichprobe (21 Klassen) und des besonderen Interesses an Cross-Level-Interaktionen war die Analyse mittels hierarchisch-linearer Modelle nicht empfehlenswert (Maas & Hox, 2005). Stattdessen wurden die Daten über Varianzanalysen mit Messwiederholung ausgewertet. Um das Ausmaß möglicher differenzieller Effekte gut abschätzen zu können, bestand die Analyse aus drei Teilen: Erstens wurde die Wirksamkeit des Trainings für die Gesamtstichprobe sowie für alle vier intelligenz- und leistungsbasierten Subgruppen getrennt voneinander untersucht (jeweils über die Interaktion Messzeitpunkt x Bedingung). Zweitens wurden die Interaktionseffekte formal über die Interaktion von Messzeitpunkt, Bedingung und Zugehörigkeit zu einer intelligenz- bzw. leistungsbasierten Subgruppe untersucht. Drittens wurde mit dem Effektstärkenmaß d für die Gesamtgruppe und für jede Subgruppe ein Maß berichtet, das unabhängig von der jeweiligen Stichprobengröße ist (Bortz & Döring, 2006).

Insgesamt zeigte sich die Wirksamkeit des Trainings im Vergleich mit dem regulären Unterricht in den Varianzanalysen sowohl für die Gesamtgruppe als auch für jede der untersuchten Subgruppen. Bei Schüler/-innen der Trainingsbedingung stieg die Präferenz für SRL sowohl während des Trainingszeitraums als auch in den anschließenden Wochen bis zum Follow-up an, während sie bei Schüler/-innen der Kontrollbedingung konstant blieb oder abnahm – mit einer Ausnahme: Aus für uns auch post-hoc nicht schlüssig erklärbaren Gründen stieg die Präferenz für SRL auch bei den hochintelligenten Schüler/-innen der Kontrollgruppe während des Trainingszeitraums an, ging bis zum Follow-up aber wieder auf das Ursprungsniveau zurück. Aufgrund dieses Datenmusters konnte die Wirksamkeit des Trainings bezüglich der Präferenz für SRL für hochintelligente Schüler/-innen nur zum Follow-up nachgewiesen werden (Ergebnis zu Ziel 3a). Die Effektstärke war dabei mit $d = 0.50$ größer als in der Gesamtgruppe und in der Gruppe der Schüler/-innen mit durchschnittlicher Intelligenz. Die Analyse der Trainingsleistungen zeigte, dass sich hochintelligente Schüler/-innen über alle fünf Übungswochen hinweg in ihren Leistungen verbesserten (Ergebnis zu Ziel 3b). Die hochleistenden Schüler/-innen profitierten vom Trainingsprogramm bezüglich der Präferenz für SRL sowohl kurz- als auch langfristig. Die Effekte waren mit $d = 0.44$ zum Post-Test und $d = 0.82$ zum Follow-up größer als die Effekte in allen anderen Gruppen. Die hochleistenden Schüler/-innen verbesserten ihre Leistungen hauptsächlich in den ersten drei Übungswochen und blieben danach in ihren Leistungen auf hohem Niveau nahezu konstant.

3.4 Hängen ungenaue Selbsteinschätzungen und unrealistische Zielsetzungen bei Grundschüler/-innen mit Gedächtnisdefiziten und Wunschdenken zusammen? (Artikel 4)

Sontag, C., & Stoeger, H. (under review). Are inaccurate self-assessment and unrealistic goal-setting among elementary school students related to memory deficits and wishful thinking?

Die in Artikel 1-3 berichteten Befunde zeigten, dass die Förderung von SRL bei Schüler/-innen am Ende der Grundschulzeit unabhängig von Intelligenz und bisherigen Schulleistungen der Schüler/-innen notwendig ist, und dass eine wirksame Förderung über eine in den normalen Unterricht integrierte, lehrergeleitete Maßnahme möglich ist. Obwohl die Effektstärken für eine lehrergeleitete Maßnahme als hoch einzuschätzen sind, reichen sie nicht an Effektstärken heran, wie sie in forscher-geleiteten Kleingruppentrainings erzielt werden können. Eine Möglichkeit, die Wirksamkeit der Maßnahme noch weiter zu verbessern, ohne auf die lehrergeleitete Umsetzung im Klassenverband zu verzichten, besteht darin, bei der Vermittlung noch stärker die spezifischen Schwierigkeiten von Viertklässler/-innen zu berücksichtigen. Dazu ist es allerdings auch notwendig, noch besser als bisher zu verstehen, aus welchen Gründen die Lernenden Schwierigkeiten mit den einzelnen SRL-Teilprozessen haben. Für die vorliegende Arbeit wurden derartige Erkenntnisse für „Selbsteinschätzung“ und „Ziele setzen“ gewonnen. Diese beiden Prozesse wurden ausgewählt, da sie zu Beginn eines Lernzyklus ausgeführt werden und damit auch die Grundlage für alle nachfolgenden Teilprozesse bilden (Ziegler und Stöger, 2005). Da sich in experimentellen Studien mit jüngeren Kindern Hinweise fanden, dass möglicherweise Gedächtnisdefizite bei der Erinnerung von vergangenen Leistungen (Parsons & Ruble, 1977; Shaklee & Tucker, 1979; Visé & Schneider, 2000) und/oder Wunschdenken (Dweck, 2002; Stipek, 1984; Visé & Schneider, 2000) eine Rolle spielen könnten, wurden diese beiden möglichen Gründe gezielt untersucht. Wir hielten es für möglich, dass ein Zusammenhang besteht zwischen einer ungenauen Erinnerung an vorherige Leistungen einerseits und ungenauen Selbsteinschätzungen bzw. unrealistischen Zielen andererseits (vgl. Ziel 5a). Ebenso hielten wir es für möglich, dass Kinder, die nicht zwischen Wünschen einerseits und Selbsteinschätzung bzw. Zielsetzung andererseits unterscheiden (Dweck, 2002, Stipek, 1984), zu übermäßig hohen Selbsteinschätzungen bzw. Zielsetzungen neigen (vgl. Ziel 5b).

Um Gedächtnisdefizite und Wunschdenken als Gründe für ungenaue Selbsteinschätzung und unrealistische Zielsetzungen bei Viertklässler/-innen zu untersuchen, wurde eine Querschnittsstudie mit 24 Viertklässler/-innen durchgeführt, wobei quantitative und qualitative Daten kombiniert wurden. Die Datenerhebung erfolgte durch von der Erstautorin intensiv geschulte Lehramtsstudentinnen in zwei verschiedenen Klassen während der regulären Unterrichtszeit. In einer Einführungsstunde wurden die Schüler/-innen mit der später zu bearbeiteten Aufgabe vertraut gemacht. Die Schüler/-innen lernten, wie sie Hauptaussagen in Sachtexten identifizieren und durch Unterstreichen markieren können. Anschließend bearbeiteten die Schüler/-innen zwei Wochen lang täglich eine Leseaufgabe, bei der sie jeweils in einem kurzen Sachtext die zehn darin enthaltenen Hauptaussagen identifizieren, unterstreichen und herausschreiben sollten. Diese Aufgabe wurde gewählt, da sie von hoher schulischer Relevanz ist und gleichzeitig einen Vergleich der tatsächlichen Leistung mit Selbsteinschätzungen und Zielen der Schüler/-innen erlaubt. Zudem lagen mit dem Material von Stöger und Ziegler (2008b) bereits Aufgaben von vergleichbarer Länge und Schwierigkeit vor. Für die vorliegende Studie wurden aus diesem Material zehn Aufgaben ausgewählt und in einem Leseheft zusammengefasst. Die Schüler/-innen bearbeiteten die Aufgaben direkt in diesem Leseheft und notierten dort auch Selbsteinschätzungen, Ziele und die jeweils erreichten Leistungen. Die Schüler/-innen setzten sich zu Beginn jeder Woche ein wöchentliches Leistungsziel. Die Selbsteinschätzung in Bezug auf die Aufgabe erfolgte täglich direkt vor der Bearbeitung des Textes. Die tatsächliche Leistung wurde nach der Bearbeitung der Aufgabe durch eine Korrektur anhand von Musterlösungen ermittelt.

Die Erinnerung an Leistungen in den vergangenen Tagen sowie die Wünsche in Bezug auf die Aufgabe wurden in Einzelinterviews erhoben. In diesen wurden auch subjektive Begründungen für Selbsteinschätzungen und Zielsetzungen erfragt. Um mögliche Interferenzen zu minimieren, wurden mit jedem Kind zwei getrennte Interviews geführt: ein Interview zur Selbsteinschätzung (am Donnertag) und eines zum Zielesetzen (am Montag). Um Reihenfolgen-Effekten entgegenzuwirken, wurde die Hälfte der Schüler/-innen zuerst zu Selbsteinschätzungen, dann zum Zielesetzen befragt, die andere Hälfte zuerst zum Zielesetzen und dann zur Selbsteinschätzung. Im Vergleich zur Studie von Visé und Schneider (2000) sind am Design der vorliegenden Studie vier Punkte besonders hervorzuheben: Die Schüler/-innen bearbeiteten, erstens, eine schulrelevante Aufgabe, und das, zweitens, in einer vergleichsweise natürlichen Lernumgebung. Drittens erfolgte die Aufforderung, sich an vergangene Leistungen zu erinnern, in einem deutlich größeren zeitlichen Abstand zur Aufgabenbearbeitung mit Leistungsrückmeldung. Viertens wurden die Schüler/-innen auch nach ihren subjektiven Gründen für Selbsteinschätzungen und Zielsetzungen befragt. Um die Forschungsfragen zu beantworten, wurden zunächst die Daten zu Wochenzielen, Selbsteinschätzungen und Leistungen aus den Leseheften und die Daten zu Erinnerungen an vergangene Leistungen und zu Wünschen aus den transkribierten Interviews entnommen. Aus diesen Rohdaten wurden Kennwerte für die Genauigkeit der Selbsteinschätzungen und die Angemessenheit der Ziele berechnet und mit den ebenfalls berechneten Variablen „Genauigkeit der Erinnerung an vergangene Leistungen“ und „Wunschdenken“ in Beziehung gesetzt. Die von den Schüler/-innen im Interview genannten subjektiven Gründe für Selbsteinschätzungen und Zielsetzungen wurden von zwei Ratern beurteilt. Die Rater entschieden für jede Antwort, ob die Schüler/-innen Wünsche und/oder vergangene Leistungen als Gründe nannten.

Die Überprüfung der Gedächtnisdefizithypothese ergab, dass sich die Viertklässler/-innen insgesamt sehr gut an ihre vergangenen Leistungen erinnerten. Wir fanden keine Zusammenhänge zwischen Ungenauigkeit in der Erinnerungsleistung einerseits und ungenauer Selbsteinschätzung bzw. unrealistischen Zielen andererseits (Ergebnis zu Ziel 5a). Zusätzlich ergaben die Interview-daten, dass nur wenige Kinder (weniger als 1/5 der Kinder für Selbsteinschätzung, weniger als die Hälfte der Kinder für Zielsetzungen) bewusst Leistungsinformationen für die Selbsteinschätzung bzw. für das Setzen eines Zieles nutzten. Zusammengenommen weisen unsere Daten darauf hin, dass zwar kein Erinnerungsdefizit, aber ein Nutzungsdefizit vorliegt, ein Muster, das auch bereits von Visé und Schneider (2000) bei jüngeren Schüler/-innen vermutet worden war.

Die Überprüfung der Wunschdenkenshypothese zeigte, dass es mit Ausnahme eines einzelnen Kindes allen Viertklässler/-innen gelang, zwischen Wünschen und Selbsteinschätzung zu unterscheiden, so dass wir keinen Zusammenhang zwischen Wunschdenken und zu hohen Selbsteinschätzungen fanden. Bis auf drei der Schüler/-innen gelang auch allen Kindern die Unterscheidung zwischen Wünschen und Zielen. Trotz des seltenen Auftretens von Wunschdenken in Bezug auf Zielesetzen, ließ sich der Zusammenhang zwischen Wunschdenken und unrealistisch hohen Zielsetzungen statistisch nachweisen (Ergebnis zu Ziel 5b).

4. Resümee

In dieser Arbeit wurden Erkenntnisse zum SRL bei Schüler/-innen am Ende der Grundschulzeit gewonnen. An dieser Stelle wird ein abschließendes Resümee gezogen. Zunächst werden die zentralen Befunde vor dem Hintergrund der Ziele und Fragestellungen der Arbeit interpretiert und eingeordnet (4.1). Anschließen werden Schlussfolgerungen für die Praxis dargestellt (4.2).

Schließlich werden Grenzen der Arbeit aufgezeigt und Vorschläge für zukünftige Forschungsvorhaben herausgearbeitet (4.3).

4.1 Interpretation und Einordnung der zentralen Befunde

In diesem Abschnitt werden die zentralen Befunde vor dem Hintergrund der Ziele und Fragestellungen der Arbeit interpretiert und eingeordnet.

4.1.1 Ausgangslage: Präferenz für SRL bei Schüler/-innen am Ende der Grundschulzeit (Ziel 1)

Das erste Ziel der Arbeit war die Untersuchung der Ausgangslage: Es sollte untersucht werden, welchen von drei Lernzugängen (SRL, external gesteuertes Lernen oder impulsives Lernen; Ziegler, et al., 2010) Viertklässler/-innen präferieren, wenn sie nach dem aktuell gültigen Lehrplan unterrichtet und darüber hinaus nicht speziell in SRL geschult werden. Dieses Ziel wurde erreicht. Unsere Daten aus regulären vierten Klassen zeigten, dass SRL für Schüler/-innen am Ende der Grundschulzeit nicht der bevorzugte Lernzugang ist – sie wählten SRL in etwa genauso häufig wie external gesteuertes oder impulsives Lernen. Obwohl SRL zum Zeitpunkt der Studiendurchführung bereits seit geraumer Zeit im Lehrplan verankert war und gerade für das Ende der Grundschulzeit gefordert wurde (vgl. Bayerisches Staatsministerium für Unterricht und Kultus, 2000), nahm die Präferenz für SRL auch im Verlauf der vierten Klasse nicht zu. Zwar gaben die Schüler/-innen zwischenzeitlich an, einzelne Teilprozesse, nämlich Selbsteinschätzung und Zielesetzen, vermehrt selbstreguliert durchzuführen; allerdings blieb diese Zunahme nicht dauerhaft erhalten. Möglicherweise wurden Selbsteinschätzung und Zielesetzen punktuell im Unterricht thematisiert und eingeübt, aber nicht längerfristig verankert. Generell scheinen alle SRL-Aspekte im Schulalltag nicht so stark gefordert und gefördert zu werden, dass die Schüler/-innen SRL zunehmend als präferierten Lernzugang annehmen.

In diesem Zusammenhang könnte es auch eine Rolle spielen, dass die Noten der vierten Klasse dafür entscheidend sind, welche Schulform die Schüler/-innen im kommenden Schuljahr besuchen können. Da für die Schüler/-innen im Untersuchungszeitraum also viel auf dem Spiel stand, erschien es ihnen möglicherweise ratsam, sich genau daran zu halten, was Lehrkräfte oder Eltern ihnen rieten, anstatt mit SRL zu experimentieren (Harlen & Deakin Crick, 2003). Allerdings stützen unsere Daten diese Vermutung nicht: Zusätzliche Analysen ergaben eine leichte Abnahme des external gesteuerten Lernverhaltens im Studienverlauf, während das impulsive Lernverhalten im gleichen Zeitraum leicht zunahm.

Die HLM-Analysen der längsschnittlichen Daten ermöglichten es uns, Varianzen in den Verlaufsdaten zu zerlegen in Anteile, die auf individuelle Schülerunterschiede zurückgehen, und in Anteile, die auf die Zugehörigkeit zu einer bestimmten Klasse zurückzuführen sind. Interessanterweise war es für die Entwicklung der Präferenz für SRL entscheidend, welche Klasse ein Kind besuchte, wohingegen individuelle Schülermerkmale eine untergeordnete Rolle spielten. Dieser Befund lässt sich plausibel damit erklären, dass Lehrkräfte in den an der Studie teilnehmenden Klassen SRL mit sehr unterschiedlicher Intensität im Unterrichtsalltag fordern und fördern. Er kann auch als Hinweis darauf gewertet werden, dass es vielversprechend ist, Lehrkräfte darin zu schulen, ein bereits ausgearbeitetes SRL-Training während ihres regulären Unterrichts durchzuführen.

4.1.2 SRL-Förderung durch eine lehrergeleitete Maßnahme (Ziel 2)

Das zweite Ziel der Arbeit bestand darin, die Wirksamkeit einer lehrergeleiteten SRL-Fördermaßnahme nachzuweisen, in der metakognitive und kognitive Strategien eingebettet in einen Zyklus selbstregulierten Lernens vermittelt und eingeübt werden. Die Wirksamkeit sollte sowohl im

Vergleich zu regulärem Unterricht als auch im Vergleich zu einem reinen Training kognitiver Strategien nachgewiesen werden. Auch dieses Ziel wurde erreicht.

Aus theoretischer Perspektive ist besonders interessant, dass das Training, in dem metakognitive und kognitive Strategien in Kombination eingeübt werden, einem reinen Training aufgabenspezifischer kognitiver Strategien tatsächlich überlegen ist. Die Befürchtung, die Komplexität des kombinierten Trainings könnte bei Viertklässler/-innen zu *cognitive overload*, und damit zu schlechteren Leistungen, führen, ist nicht eingetreten. Bemerkenswerterweise ist die Überlegenheit des kombinierten Trainings nicht nur bei der Präferenz für SRL zu beobachten, sondern auch bei der Trainingsaufgabe, Hauptaussagen in Sachtexten zu identifizieren. Im Gegensatz zu einer ähnlichen Intervention im Mathematik-Unterricht (Stoeger & Ziegler, 2008a), traten die Verbesserungen in der Trainingsaufgabe im hier untersuchten Training gleichmäßig im gesamten Trainingszeitraum auf. Dies deutet darauf hin, dass die Schüler/-innen im Laufe der Zeit immer besser mit den vermittelten Textreduktionsstrategien umgehen konnten und zudem über den gesamten Trainingszeitraum motiviert waren, sie auch einzusetzen. Der Transfereffekt auf die allgemeine Lesekompetenz zeigte sich nur in Klassen mit einem höchstens durchschnittlichen Anteil an Schüler/-innen mit Migrationshintergrund. Zusammen mit dem Befund, dass auch der Effekt auf die Präferenz für SRL stärker zutage trat, wenn der Anteil an Schüler/-innen mit Migrationshintergrund pro Klasse statistisch kontrolliert wurde, und der Tatsache, dass der Migrationsstatus bei allen Analysen zusätzlich bereits auf individueller Ebene kontrolliert worden war, deutet dieses Ergebnis auf eine erschwerte Trainingsumsetzung in Klassen mit hohem Anteil an Schüler/-innen mit Migrationshintergrund hin.

Aus praktischer Perspektive ist der Vergleich des kombinierten Trainings mit dem regulären Unterricht von besonderem Interesse. Wir zeigten, dass die Förderung selbstregulierten Lernens anhand eines strukturierten Trainingsprogramms besser gelang als im regulären Unterricht, in dem eine derartige Förderung laut Lehrplan ebenfalls gefordert wurde. Bemerkenswert ist, dass das Trainingsprogramm nicht von externen Trainer/-innen, sondern von den regulären Lehrkräften durchgeführt wurde und während der regulären Unterrichtszeit im Klassenkontext stattfand. Somit lässt sich festhalten, dass sich durch eine entsprechende Schulung und Begleitung von Lehrkräften und durch das Bereitstellen von Trainingsmaterialien die Förderung selbstregulierten Lernens im regulären Unterricht deutlich verbessern lässt.

4.1.3 Ausgangslage: Präferenz für SRL bei hochintelligenten Schüler/-innen am Ende der Grundschulzeit (Ziel 3)

Das dritte Ziel bestand darin, die Präferenz für SRL bei hochintelligenten Grundschüler/-innen zu untersuchen, und zwar sowohl zu Beginn des vierten Schuljahres als auch in dessen Verlauf. Auch dieses Ziel wurde erreicht. Die immer noch verbreitete Annahme (Treffinger, 2009), hochintelligente Schüler/-innen lernten besonders gerne selbstreguliert, wurde durch unsere Daten nicht gestützt. Die Befunde zeigten vielmehr, dass hochintelligente Schüler/-innen SRL nicht gegenüber anderen Lernzugängen bevorzugen und dass sie sich in ihrer Präferenz nicht von ihren durchschnittlich intelligenten Peers unterscheiden. Zudem stellten wir keinen Zusammenhang zwischen der Präferenz für SRL und der Intelligenz der Schüler/-innen fest.

Aus methodischer Perspektive lassen sich fehlende Zusammenhänge nicht durch eine eingeschränkte Varianz erklären, denn die Varianz war in unserer unselektierten Stichprobe sowohl bei der Intelligenz als auch bei allen SRL-Variablen beträchtlich. Allerdings könnte die kleine Stichprobengröße in der Gruppe der hochintelligenten Schüler/-innen dazu geführt haben, dass möglicherweise vorhandene Gruppenunterschiede übersehen wurden. Ein Blick auf die Mittelwerte zeigte allerdings, dass etwaige Gruppenunterschiede zu Ungunsten der hochintelligenten Schüler/-

innen ausfallen würden, sie also SRL weniger präferierten als ihre durchschnittlich intelligenten Peers.

Dieser Befund lässt sich plausibel dadurch erklären, dass (auch hochintelligente) Schüler/-innen ihr Lernen nur dann selbst regulieren, wenn es ihnen notwendig und sinnvoll erscheint (Rabinowitz, Freemann, & Cohen, 1992). Können gute Leistungen auch ohne den zusätzlichen Aufwand erreicht werden, den SRL mit sich bringt, ist es effizienter, nicht selbstreguliert zu lernen. Zusätzlich Analysen zeigten, dass die hochintelligenten Schüler/-innen in unserer Stichprobe tatsächlich bessere Noten erreichten als ihre Peers, und das, obwohl sie nicht selbstregulierter lernten.

Die Befunde zur Entwicklung der Präferenz für SRL im Laufe des vierten Schuljahrs weisen in die gleiche Richtung: Die Entwicklung war unabhängig von der Intelligenz der Schüler/-innen, und hing vielmehr damit zusammen, welche Klasse die Schüler/-innen besuchten. Dieser Befund zeigt die vergleichsweise hohe Bedeutung der Lernumwelt für die Entwicklung des Lernverhaltens auf. Gleichzeitig erhärtet sich durch diesen Befund die Vermutung, dass die heterogene Befundlage in anderen Studien (vgl. im Überblick Sontag & Stöger, 2010) tatsächlich auf die Konfundierung von Intelligenz und Lernumwelt zurückgeführt werden kann. Im Übrigen kann der Befund als weiterer Hinweis darauf gewertet werden, dass auch hochintelligente Schüler/-innen von einer durch ein lehrergeleitetes SRL-Training veränderten Lernumwelt profitieren könnten.

4.1.4 Lehrergeleitete SRL-Förderung bei hochintelligenten Schüler/-innen in heterogenen Klassen (Ziel 4)

Als viertes Ziel wurde angestrebt, zu zeigen, dass hochintelligente Schüler/-innen – wie ihre durchschnittlich intelligenten Mitschüler/-innen auch – von einem lehrergeleiteten SRL-Training (Stöger & Ziegler, 2008b) im regulären Unterricht profitieren, und zwar sowohl bezüglich der Präferenz für SRL als auch bezüglich der Trainingsleistungen. Dieses Ziel wurde erreicht. Zusätzlich zeigten wir, dass auch hochleistende Schüler/-innen und ihre Mitschüler/-innen mit durchschnittlichen Leistungen vom Training profitierten.

Hochintelligente Schüler/-innen verbesserten sich bezüglich der Präferenz für SRL sowohl während des Trainings als auch in der Zeit nach dem Training. Da bei den hochintelligenten Schüler/-innen der Kontrollgruppe während des Trainingszeitraum ebenfalls ein Anstieg in der Präferenz für SRL zu verzeichnen war, konnte der Vorteil des Trainings formal nur langfristig nachgewiesen werden. Der Anstieg bei hochintelligenten Schüler/-innen der Kontrollgruppe war unerwartet, für uns auch im Nachhinein nicht plausibel erklärbar und – vor allem – auch nicht von Dauer. Der (vorhandene) langfristige Trainingseffekt für hochintelligente Schüler/-innen ist unserer Ansicht nach relevanter, da er zeigt, dass die trainierten Schüler/-innen SRL auch dann weiterhin bevorzugten, wenn die externe Unterstützung sich verringerte. Auswertungen der Trainingsleistungen im Verlauf zeigten, dass sowohl die Trainingsdauer als auch die Aufgabenschwierigkeit für hochintelligente Schüler/-innen angemessen war, da sie ihre Leistungen im gesamten Trainingszeitraum verbesserten und es nicht zu Deckeneffekten kam.

Hochleistende Schüler/-innen profitierten bezüglich der Präferenz für SRL sowohl kurz- als auch langfristig vom Training. In ihren Trainingsleistungen verbesserten sich die hochleistenden Schüler/-innen hauptsächlich in den ersten drei Übungswochen und blieben dann auf hohem Niveau konstant. Dies zeigt, dass diese Schüler/-innen – wie auch im bisherigen Unterricht – bereit und in der Lage waren, die an sie gestellten Anforderungen schnell zu erkennen und zu erfüllen. Möglicherweise würden hochleistende Schüler/-innen von anspruchsvolleren und komplexeren Trainingsaufgaben zusätzlich profitieren.

Insgesamt zeigen unsere Ergebnisse, dass die Befürchtung, hochintelligente und hochleistende Schüler/-innen würden von einem SRL-Training im regulären Unterricht nicht profitieren (Treffinger, 2009), unbegründet ist. Da bisher generell nur wenige Studien zur differenziellen Wirksamkeit von

SRL-Trainings vorliegen, und diese sich hauptsächlich mit der Wirksamkeit für leistungsschwache Schüler/-innen und für Schüler/-innen mit Lernschwierigkeiten beschäftigten (z. B. Graham, Harris, & McKeown, 2013), liefert die Studie auch in dieser Hinsicht einen wichtigen Beitrag.

4.1.5 Gründe für ungenaue Selbsteinschätzungen und unrealistische Zielsetzungen bei Viertklässler/-innen (Ziel 5)

Das fünfte Ziel der Arbeit bestand darin, mögliche Gründe für ungenaue Selbsteinschätzungen und unrealistische Zielsetzungen bei Schüler/-innen am Ender der Grundschulzeit zu untersuchen. Insbesondere sollte die Gedächtnisdefizithypothese (Parsons & Ruble, 1977; Shaklee & Tucker, 1979; Visé & Schneider, 2000) und die Wunschdenkenshypothese (Dweck, 2002; Stipek, 1984; Visé & Schneider, 2000) untersucht werden. Die Studie sollte möglichst so angelegt sein, dass die Ergebnisse leicht für die schulische SRL-Förderung im Klassenverband genutzt werden können. Auch dieses Ziel wurde erreicht.

Die Überprüfung der Gedächtnisdefizithypothese ergab, dass sich die Viertklässler/-innen insgesamt sehr gut an ihre vergangenen Leistungen erinnerten, auch wenn diese mehrere Tage zurücklagen. Viele Kinder erinnerten sich korrekt, und diejenigen, die sich nicht korrekt erinnerten, wichen nur wenig von den korrekten Leistungen ab. Aufgrund der eingeschränkten Varianz in den Erinnerungsleistungen ist es wenig überraschend, dass wir keine Zusammenhänge zwischen Ungenauigkeit in der Erinnerungsleistung einerseits und ungenauer Selbsteinschätzung bzw. unrealistischen Zielen andererseits fanden. Zusätzlich ergaben die Interviewdaten, dass nur wenige Kinder bewusst Leistungsinformationen für die Selbsteinschätzung bzw. für das Setzen eines Zieles nutzten. Zusammengenommen weisen unsere Daten darauf hin, dass zwar kein Erinnerungsdefizit, aber ein Nutzungsdefizit vorliegt – ein Muster, das auch von Visé & Schneider (2000) für jüngere Kinder vermutet worden war. Das Nutzungsdefizit wurde in der vorliegenden Studie möglicherweise auch dadurch verstärkt, dass die Schüler/-innen zehn Texte bearbeiteten, die zwar von Struktur und Schwierigkeit vergleichbar, thematisch aber unterschiedlich waren. Die thematische Unterschiedlichkeit könnte dazu beigetragen haben, dass die Schüler/-innen die Relevanz ihrer vorherigen Leistungen für die nächste Aufgabe unterschätzten. Diese Interpretation wird gestützt von den Ergebnissen einer experimentellen Studie, in der gezeigt wurde, dass Vorschüler/-innen Leistungsinformationen aus identischen, nicht aber aus ähnlichen Aufgaben für ihre Leistungsvorhersage nutzen (Lipko-Speed, 2013).

Die Überprüfung der Wunschdenkenshypothese zeigte, dass bis auf ein Kind alle Viertklässler/-innen klar zwischen Wünschen und Selbsteinschätzung unterschieden, so dass wir darauf verzichteten, einen Zusammenhang zwischen Wunschdenken und zu hohen Selbsteinschätzungen zu berechnen. Dieses Ergebnis deutet auf einen Entwicklungstrend hin, denn Drittklässler/-innen in der Studie von Visé und Schneider (2000) gelang diese Unterscheidung größtenteils nicht. Tatsächlich war das oben erwähnte, einzige Kind, dem diese Unterscheidung nicht gelang, mit 9 Jahren 11 Monaten eines der jüngsten in unserer Stichprobe.

Bis auf drei der Schüler/-innen gelang auch allen Kindern die Unterscheidung zwischen Wünschen und Zielen. Interessanterweise konnten wir trotz des seltenen Auftretens von Wunschdenken in Bezug auf Zielesetzen einen Zusammenhang zwischen Wunschdenken und unrealistisch hohen Zielsetzungen feststellen. Alle drei Schüler/-innen, die nicht zwischen Wünschen und Zielen unterschieden, setzten sich unrealistisch hohe Ziele, und sie taten dies in einem größeren Ausmaß als die anderen Schüler/-innen, die zwischen Wünschen und Zielen unterschieden.

Die vorliegende Studie war so angelegt, dass sich die Ergebnisse leicht auf die schulische SRL-Förderung im Klassenverband übertragen lassen: Erstens wurde die Studie während des regulären Unterrichts im Klassenverband durchgeführt, so dass die Situation mit der Fördersituation vergleichbar ist. Zweitens wurde in einem Zeitraum von zwei Wochen an jedem Schultag eine Aufgabe bearbeitet; es wurde also ein Abstand zwischen Aufgaben gewählt, wie er sowohl im SRL-Training von Stöger und Ziegler (2008b) als auch im Schulalltag vorzufinden ist. Drittens wurden Aufgaben gestellt, die einander zwar ähnlich, aber nicht völlig identisch waren – eine Situation, die ebenfalls sowohl im SRL-Training von Stöger und Ziegler (2008b) als auch im Unterrichtsalltag aufritt. Die aus der vorliegenden Studie gezogenen Schlussfolgerungen für die Praxis werden in Abschnitt 4.2.4 beschrieben.

4.2 Schlussfolgerungen für die Praxis

Aus den Ergebnissen der Studien lassen sich vor dem Hintergrund aktueller Fachliteratur Schlussfolgerungen und Empfehlungen für die Schulpraxis ableiten, die im Folgenden ausgeführt werden.

4.2.1 Stärkung schulischer SRL-Förderung

Unsere Befunde zeigen, dass Schüler/-innen am Ende der Grundschulzeit nicht in dem Maße selbstreguliert lernen, wie es bereits seit geraumer Zeit als wünschenswert formuliert wird und auch im Lehrplan festgehalten ist (z. B. Bayerisches Staatsministerium für Unterricht und Kultus, 2000). Eine Stärkung der schulischen SRL-Förderung erscheint deshalb notwendig und sinnvoll. Im LehrplanPlus, der nach Durchführung der Studien in bayerischen Grundschulen verpflichtend eingeführt wurde (Bayerisches Staatsministerium für Unterricht und Kultus, 2014), kommt vielen Aspekten selbstregulierten Lernens im Rahmen des kompetenzorientierten Unterrichts ein noch höherer Stellewert zu. Dies, und die Tatsache, dass Lehrkräfte über Handreichungen (z. B. Staatsinstitut für Schulqualität und Bildungsforschung, 2015) auch konkrete Anregungen erhalten, wie sie bei ihren Schüler/-innen Aspekte selbstregulierten Lernens fördern können, ist vor dem Hintergrund der eigenen Studien zu begrüßen.

Um die Förderung von SRL bei Schüler/-innen im vierten Schuljahr sowohl zeitnah als auch längerfristig zu verbessern, bietet sich – im Einklang mit den im LehrplanPlus genannten Aspekten – eine Kombination von Maßnahmen an: Zunächst können Lehrkräfte strukturierte, bereits evaluierte Trainingsprogramme während der regulären Unterrichtszeit durchführen. Auf diese Weise können insbesondere Lehrkräfte mit geringen Vorkenntnissen vergleichsweise schnell gute Effekte erzielen. Dabei ist es besonders hilfreich, wenn die Programmdurchführung im Rahmen einer Lehrerfortbildung vorbereitet und begleitet wird. In diesem Rahmen kann auch besprochen werden, welche Veränderungen und Anpassungen am Training sinnvoll sein könnten – sei es aufgrund neuerer empirischer Befunde, aufgrund einer besonderen Klassensituation oder aufgrund der Tatsache, dass einzelne SRL-Aspekte im Rahmen der Umsetzung des LehrplanPlus bereits in der Klasse behandelt wurden – und welche Elemente besser nicht verändert werden sollten, um den Trainingserfolg nicht zu gefährden. Längerfristig sollten Lehrkräfte grundlegende Prinzipien zur Förderung selbstregulierten Lernens in möglichst vielen Fächern in den Unterricht integrieren (Perry & Rahim, 2011), wobei auch dieses Vorgehen durch geeignete Fortbildungen und durch Austausch zwischen Lehrkräften unterstützt werden sollte.

4.2.2 Einsatz des evaluierten Programms im regulären Unterricht als Einstieg in die Förderung selbstregulierten Lernens

Die Evaluation des Trainingsprogramms von Stöger und Ziegler (2008b) zeigte, dass sich das Programm gut für die lehrergeleitete SRL-Förderung in vierten Grundschulklassen eignet, da Schüler/-innen mit unterschiedlichen Lernvoraussetzungen davon profitieren. Die Befürchtung, hochintelligente und/oder sehr leistungsstarke Schüler/-innen würden nicht vom Programm profitieren, konnte entkräftet werden. Vor allem für Lehrkräfte, die wenig Vorkenntnisse und

Vorerfahrungen in der Vermittlung selbstregulierten Lernens haben, ist die Umsetzung eines bereits evaluierten Programms zu empfehlen. Da theoretische Konzepte und empirische Befunde bereits in ein Trainingskonzept und in zugehörige Materialien übersetzt worden sind, müssen sich Lehrkräfte nicht selbst mit dieser (durchaus komplexen und fehleranfälligen) Aufgabe beschäftigen. Stattdessen können sie ihre Zeit auf das Verstehen der theoretischen Hintergründe und auf die konkrete Umsetzung des Programms in ihren Klassen verwenden. Da die gewünschte Trainingswirkung bereits nachgewiesen wurde, können die Lehrkräfte außerdem zuversichtlich sein, dass sie mit ihren Bemühungen, SRL bei ihren Schüler/-innen zu fördern, auch Erfolg haben werden. Dies wiederum begünstigt, dass die Lehrkräfte das mit Aufwand und Anstrengung verbundene Vorhaben der Förderung selbstregulierten Lernens auch tatsächlich umsetzen (Schwarzer & Jerusalem, 2002).

4.2.3 Vorbereitung und Begleitung von Lehrkräften

Im Rahmen der vorliegenden Arbeit wurden Lehrkräfte mit einer Lehrerfortbildung auf die Umsetzung der SRL-Trainingsmaßnahme vorbereitet und anschließend bei der Durchführung der Maßnahme begleitet. Die Wirksamkeit des Trainingsprogramms wurde unter anderem dadurch ermöglicht, dass bei der Fortbildung Prinzipien beachtet wurden, die eine erfolgreiche Implementation im Unterricht wahrscheinlich machen. Damit die lehrkraftgeleitete Förderung von Schüler/-innen auch in Zukunft gut gelingt, ist es wünschenswert, dieses bewährte Vorgehen weiterhin beizubehalten.

Die Fortbildung wurde, erstens, als mehrtägige Veranstaltung geplant, so dass ausreichend Zeit zur Verfügung stand, in der sich die teilnehmenden Lehrkräfte mit den Fortbildungsinhalten auseinandersetzen konnten (Lipowsky & Rzejak, 2012). Zweitens wurde darauf geachtet, dass sich theoriebasierter Input, Erprobung von konkretem Material und sich anschließende Diskussionen zur Umsetzung im Unterricht sinnvoll ergänzen (Lipowsky & Rzejak, 2012). Drittens erhielten die teilnehmenden Lehrkräfte Material, das sich unmittelbar für den Einsatz im Unterricht eignete. Da das vorbereitete Material und das ausgearbeitete Konzept die Lehrkräfte im Unterricht entlasten sollten, ohne ihre Expertise im Unterrichten in Frage zu stellen, wurden Gestaltungsspielräume, die Lehrkräfte in der Umsetzung hatten, in der Fortbildung explizit besprochen (Schwarzer & Jerusalem, 2002). Die Phase der Trainingsimplementation schloss sich unmittelbar an die Fortbildung an und wurde durch die Fortbildnerinnen begleitet. Lehrkräfte hatten Gelegenheit, Fragen zur Umsetzung direkt mit den Fortbildnerinnen und mit den anderen Lehrkräften zu diskutieren. Neben der Begleitung per E-Mail und Telefon fand dazu auch ein persönliches Treffen mit teilnehmenden Lehrkräften statt (Jerusalem, Drössler, Kleine, Klein-Heßling, Mittag, & Röder, 2007).

4.2.4 Empfehlungen bezüglich Veränderungen und Ergänzungen im Trainingsprogramm

Die in Artikel 2 und 3 berichteten Befunde zeigen, dass sich das Programm von Stöger und Ziegler (2008b) für die effektive Förderung selbstregulierten Lernens bei Viertklässler/-innen eignet und dass hochintelligente und hochleistende Schüler/-innen mindestens so viel von diesem Programm profitieren wie ihre Peers. Da im Programm zwar Materialien und generelle Abläufe vorgegeben sind, gleichzeitig aber Spielraum für die Umsetzung in der Klasse vorhanden ist, können kleinere Anpassungen an die konkrete Situation in der Klasse leicht von den Lehrkräften vorgenommen werden. Falls die Lehrkraft es als notwendig und sinnvoll erachtet, können beispielsweise unbekannte Wörter in den Sachtexten im Klassengespräch geklärt werden, bevor die Schüler/-innen die Aufgabe, zehn Hauptaussagen zu identifizieren, bearbeiten. Die Lehrkräfte haben außerdem an verschiedenen Stellen im Programm die Freiheit, die Sozialform (Einzelarbeit, Partnerarbeit, Gruppenarbeit, Plenum) so zu wählen, wie sie es für ihre Klasse als angemessen erachten. Im Rahmen dieses vorhandenen Spielraums lassen sich auch die folgenden Empfehlungen umsetzen, die sich aus den in Artikel 3 und 4 dargestellten Befunden ergeben.

In Artikel 3 hatten wir festgestellt, dass hochintelligente und hochleistende Schüler/-innen auch ohne weitere Anpassungen des Programms mindestens genauso viel vom SRL-Training profitieren wie ihre Peers. Die Analysen der Leistungen in der Trainingsaufgabe zeigten allerdings, dass hochleistende Schüler/-innen bereits nach drei Übungswochen ein Leistungsplateau erreichen. Für diese Schüler/-innen wäre also der Einsatz schwierigerer und komplexerer Texte über den gesamten Trainingszeitraum sinnvoll, damit sie auch weiterhin Leistungszuwächse aufgrund ihres verbesserten Lernverhaltens erzielen können. Eine solche Anpassung ist allerdings mit erheblichem Aufwand verbunden, da sichergestellt werden müsste, dass die 25 neuen Texte von vergleichbarer Länge und Schwierigkeit sind. Für den Schulalltag erscheint es deshalb sinnvoller, hochleistenden Schüler/-innen in den letzten beiden Trainingswochen aufzuzeigen, dass sie durch ihr verändertes Lernverhalten *zuverlässig* hohe Leistungen erzielen können. Zusätzlich könnten hochleistende Schüler/-innen dazu ermutigt werden, nun immer (auch) die anspruchsvollste Strategie – das Anfertigen von Zusammenfassungen in eigenen Worten – umzusetzen, wobei Lehrkräfte dann zusätzliches Feedback auf stilistische Aspekte der produzierten Zusammenfassungen geben könnten.

In Artikel 4 hatten wir festgestellt, dass Kinder sich sehr gut an ihre Leistungen in den vorangegangenen Trainingsaufgaben erinnern konnten, dass allerdings nur wenige Kinder dieses Wissen für die eigene Selbsteinschätzung und Zielsetzung nutzten. Um diesem Nutzungsdefizit zu begegnen, könnten die Lehrkräfte die Schüler/-innen zunächst bei jeder Selbsteinschätzung und Zielsetzung, später dann in größeren Abständen dazu auffordern, ihre vergangenen Leistungen zu berücksichtigen. Da die Möglichkeit besteht, dass Schüler/-innen aufgrund der thematisch abwechslungsreichen Texte die Relevanz ihrer vorherigen Leistungen unterschätzen, da sie die Aufgaben als unterschiedlich wahrnehmen (Lipko-Speed, 2013), erscheint es zudem sinnvoll, die Ähnlichkeit der Aufgaben explizit zu betonen.

Die Befunde zum Wunschdenken weisen darauf hin, dass es fast allen Schüler/-innen gelingt, Wünsche von Selbsteinschätzung und Zielen zu unterscheiden. Einige wenige, insbesondere jüngere Kinder hatten allerdings Schwierigkeiten, Wünsche von Zielen zu unterscheiden, und dies ging auch mit unrealistisch hohen Zielsetzungen einher. Um sicherzustellen, dass alle Kinder die Unterscheidung zwischen Zielen und Wünschen kennen, sollte sie im Unterrichtsgespräch explizit thematisiert werden, wobei die Lehrkraft hier sicherlich auf das in der Klasse vorhandene Wissen zurückgreifen kann.

4.2.5 Aspekte für die langfristige SRL-Förderung im regulären Unterricht

Die Wirksamkeit des in der vorliegenden Arbeit evaluierten Trainingsprogramms von Stöger und Ziegler (2008b) lässt sich wahrscheinlich darauf zurückführen, dass verschiedene in der Forschung als günstig identifizierte Aspekte (vgl. Dignath & Büttner, 2008; Ramdass & Zimmerman, 2011; Schunk & Rice, 1987; Weinstein, Husman, & Dierking, 2000) im Trainingsprogramm kombiniert wurden. Im Sinne einer nachhaltigen Förderung selbstregulierten Lernens erscheint es sinnvoll, möglichst viele dieser Aspekte auch auf die Förderung selbstregulierten Lernens im regulären Unterricht zu übertragen (Perry & Rahim, 2011). Folgende Aspekte eignen sich dafür aus meiner Sicht besonders gut:

Erstens erscheint es günstig, dass die Schüler/-innen ein normatives SRL-Modell kennenlernen. Die Schüler/-innen können so eine Vorstellung davon entwickeln, welche Einzelschritte sie ausführen können bzw. sollen, um ihr Lernverhalten zu verbessern. Die Schritte sollten einzeln und mit kindgerechten Beispielen eingeführt werden, und das Zusammenspiel der einzelnen Schritte, insbesondere das Zusammenspiel kognitiver und metakognitiver Strategien, sollte erläutert werden. Zweitens sollte eine kleine Auswahl aufgabenspezifischer Strategien explizit eingeführt werden, die für später zu bearbeitende Aufgaben nützlich sind. Durch die eingeschränkte Auswahl können die Schüler/-innen zwar zwischen verschiedenen Strategien wählen, gleichzeitig aber auch jede Strategie in ausreichendem Maße einüben. Drittens erscheint es notwendig, eine mehrwöchige Übungsphase vorzusehen, in der die Schüler/-innen alle Schritte selbstregulierten Lernens an für sie relevanten schulischen Inhalten einüben. Viertens sollten Aufgaben so gewählt sein, dass sich SRL tatsächlich lohnt. Das heißt, die Aufgaben sollen für alle Schüler/-innen so herausfordernd und komplex sein, dass sie nicht einfach durch bereits automatisiertes Verhalten gelöst werden können. Durch verbessertes Lernverhalten sollen die Schüler/-innen also tatsächlich Leistungssteigerungen erzielen können. Damit die Schüler/-innen den Zusammenhang zwischen verbessertem Lernverhalten und Leistungssteigerungen auch wahrnehmen können, erscheint es, fünftens, hilfreich, dass die Schüler/-innen wiederholt sehr ähnliche Aufgaben bearbeiten und systematisch Leistungsfeedback erhalten. Das Notieren von Leistungen und Lernverhalten in einem Lerntagebuch und/oder die grafische Darstellung von Lernfortschritten kann hierbei zusätzlich hilfreich sein. Sechstens sollte der Zusammenhang zwischen Lernverhalten und Leistung auch immer wieder in Klassendiskussionen und Einzelgesprächen thematisiert werden. Schließlich sollte SRL in verschiedenen Fächern, bei verschiedenen Inhalten und in verschiedenen Settings (z. B. in der Schule und während der Hausaufgaben) eingeübt werden, um den Schüler/-innen den Transfer auf weitere Fächer, Inhalte und Settings zu erleichtern.

4.3 Grenzen der Arbeit und Vorschläge für zukünftige Forschung

Im Rahmen der vorliegenden Arbeit wurden wichtige Erkenntnisse zum SRL bei Schüler/-innen am Ende der Grundschulzeit gewonnen. Abschließend möchte ich auf Grenzen der vorliegenden Arbeit eingehen und daraus Vorschläge für weitere Forschungsvorhaben ableiten.

4.3.1 Erfassung selbstregulierten Lernens

Als erste Grenze ist die Art der Erfassung selbstregulierten Lernens zu nennen. In einem Großteil der Arbeit wurde SRL als Selbstbericht per Fragebogen erfasst. Es wurde somit nicht das tatsächliche Lernverhalten erfasst, sondern eine subjektive Bewertung durch die Schüler/-innen selbst. Diese Bewertung kann beispielsweise durch falsche Erinnerung oder durch soziale Erwünschtheit verzerrt sein (Artelt, 2000; Spörer & Brunstein, 2006). Basierend auf dem normativen Modell von Ziegler und Stöger (2005) fokussierten wir zudem auf die Präferenz für SRL in verschiedenen Subprozessen, erfassten also weder die Häufigkeit, noch die Qualität bzw. die Angemessenheit selbstregulierten Lernens. In zukünftigen Studien sollten diese Aspekte ergänzend berücksichtigt und Probleme des Selbstberichts vermieden werden. Ähnlich wie wir es im Rahmen der Trainingsevaluation bereits für die Leistung in der Trainingsaufgabe gemacht haben, könnten dazu beispielsweise Verlaufsdaten aus Trainingsmaterialien oder Lerntagebüchern ausgewertet werden (Schmitz, Klug, & Schmidt, 2011). Als weitere Möglichkeiten, mit denen verschiedene Facetten selbstregulierten Lernens spezifisch, verhaltensnah und möglichst unverzerrt erfasst werden können, bieten sich die Methode des Lauten Denkens (Greene, Robertson, & Croker Costa, 2011), die Mikroanalyse (Cleary, 2011) und computergestützte Verfahren (Azevedo, R., Johnson, A., Chauncey, A., & Graesser, 2011) an. Insgesamt scheint die Kombination verschiedener Erhebungsmethoden, wie sie etwa im Rahmen detaillierter Fallstudien (Butler, 2011) umgesetzt werden kann, wünschenswert, da auf diese Weise unterschiedliche, sich ergänzende Aspekte selbstregulierten Lernens erfasst werden können (Spörer & Brunstein, 2006).

In der in Artikel 4 dargestellten Studie wurden bereits unterschiedliche Erhebungsmethoden in einem komplexen Design miteinander kombiniert, um Gründe für fehlerhafte Selbsteinschätzungen und unrealistisch Zielsetzungen bei nicht speziell geschulten Viertklässler/-innen zu untersuchen. So konnten wir die Qualität der Selbsteinschätzung und der Zielsetzung messen und mit Erinnerungen an die eigenen Leistungen und mit Aussagen zu Wünschen in Beziehung setzen. Die so gewonnenen Informationen hätten sich mit einem reinen Selbstberichtsverfahren nicht erfassen lassen. Ein Nachteil dieses Vorgehens ist, dass es sehr aufwändig in der Umsetzung ist. Aufgrund dieser Tatsache und aufgrund ökonomischer Beschränkungen wurden in der vorliegenden Arbeit lediglich zwei ausgewählte SRL-Aspekte – die ersten beiden Stufen des Models von Ziegler und Stöger (2005), Selbsteinschätzung und Zielesetzen – mit einer relativ kleinen Stichprobe untersucht. Auch wenn es aufgrund des in unserer Studie gefundenen Befundmusters unwahrscheinlich ist, dass wir tatsächlich bestehende Zusammenhänge zwischen fehlerhaften Selbsteinschätzungen und unrealistischen Zielen einerseits und fehlerhafter Erinnerung an die eigenen Leistungen und Wunschdenken andererseits übersehen haben, würde eine Replikation der Studie mit einer größeren Stichprobe die Möglichkeit des Beta-Fehlers auch statistisch minimieren. In zukünftigen Studien sollte zudem untersucht werden, aus welchen Gründen Viertklässler/-innen Schwierigkeiten bei der Ausführung der anderen im Modell von Ziegler und Stöger (2005) genannten SRL-Teilprozesse haben.

4.3.2 Gültigkeitsbereich der Evaluationsergebnisse

Zweitens möchte ich auf die Grenzen des Gültigkeitsbereichs der Evaluationsergebnisse hinweisen. Wir zeigten, dass ein Training selbstregulierten Lernens in heterogenen Klassen wirksam durchgeführt werden kann und dass sowohl hochleistende und hochintelligente Viertklässler/-innen als auch ihre Peers von der Maßnahme profitieren. Obwohl das erfreulich ist, kann man aus diesen Ergebnissen nicht schließen, dass wirklich *alle* Viertklässler/-innen *gleichermaßen* von der Maßnahme profitieren, denn der Nachweis der Wirksamkeit für verschiedenen Gruppen wurde – wie es bei Evaluationsstudien üblich ist – über den Vergleich von Gruppenmittelwerten geführt. Gerade beim SRL war aber die Varianz innerhalb aller von uns untersuchten Gruppen beträchtlich. Es gibt also in jeder Gruppe Schüler/-innen, die von dem Training besonders viel oder besonders wenig profitierten. Zukünftig wäre es sinnvoll, Faktoren zu identifizieren, die die Trainingswirkung begünstigen oder behindern.

Inhaltlich haben wir gezeigt, dass die Förderung selbstregulierten Lernens bei Viertklässler/-innen im Alter von etwa zehn Jahren gut funktioniert, wenn aufgabenspezifische kognitive Strategien (hier Textreduktionsstrategien beim Lesen von Sachtexten) eingebettet in eine Abfolge allgemeiner metakognitiver Strategien trainiert werden. Grundsätzlich nehmen wir an, dass die SRL-Förderung nach diesem Prinzip auch mit anderen Lerninhalten und in anderen Altersgruppen erfolgreich ist. Bei der Übertragung des Trainingskonzepts auf andere Inhalte sollten idealweise auch aktuelle fachdidaktische Erkenntnisse Beachtung finden; bei der Übertragung des Trainingskonzepts auf andere Altersgruppen erscheint die Berücksichtigung aktueller Erkenntnisse zu Fähigkeiten und Bedürfnissen der jeweiligen Altersgruppe besonders relevant (Wigfield, Klauda, & Cambria, 2011). In jedem Fall ist es wünschenswert, in begleitenden Evaluationsstudien zu untersuchen, inwiefern und unter welchen Bedingungen sich die vorliegenden Ergebnisse auf andere Inhalte und Altersgruppen generalisieren lassen.

4.3.3 Untersuchung von Schüler/-innen – und ihrer Lernumwelt

In diesem Kontext möchte ich schließlich eine dritte Grenze der Arbeit ansprechen: Der Fokus in der vorliegenden Arbeit lag auf den Schüler/-innen und ihren individuellen Lernvoraussetzungen, während Umweltvariablen nur eine untergeordnete Rolle zukam. Zwar wurde über die Untersuchung der Wirksamkeit einer Trainingsmaßnahme selbstverständlich auch der Einfluss einer veränderten Lernumwelt untersucht, und wir haben dabei sogar statistisch Klasseneffekte kontrolliert; allerdings wurden abgesehen vom Anteil an Schüler/-innen mit und ohne Migrationshintergrund pro Klasse keine weiteren erklärenden Umweltvariablen bei den Analysen berücksichtigt. Da sich die hohe Relevanz der Lernumwelt für die Entwicklung von SRL nicht nur in unseren eigenen Studien zeigte, sondern auch in der aktuellen Fachliteratur betont wird (z. B. Perry & Rahim, 2011), erscheint es sinnvoll, in zukünftigen Studien Analysen auf Schülerebene mit detaillierteren Analysen der Lernumwelt zu kombinieren. Bei Untersuchungen mit Grundschüler/-innen sollten dabei nicht nur Lehrkräfte und Peers, sondern auch Eltern bzw. die familiäre Umwelt in den Blick genommen werden.

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II. Artikel 1

Sontag, C., Stoeger, H. & Harder, B. (2012). The relationship between intelligence and the preference for self-regulated learning: A longitudinal study with fourth-graders. *Talent Development and Excellence, 4*, 1–22.

Gliederung (Artikel 1)

The Relationship Between Intelligence and the Preference for Self-Regulated Learning:
A Longitudinal Study with Fourth-Graders

The Relationship Between Intelligence and the Preference for Self-Regulated Learning: A Longitudinal Study with Fourth-Graders

Abstract. The assumption that highly intelligent students prefer self-regulated learning (SRL) over other forms of learning is still common in the field of gifted education, but existing research yields heterogeneous results. We examined the relationship between intelligence and SRL, thereby avoiding methodological and design problems inherent in many empirical studies to date. 368 fourth-grade students from 19 different German classrooms took Raven's intelligence test at the beginning of the school year and responded to a questionnaire based on Ziegler and Stoeger's (2005) cyclical model of SRL at three different points in time. Highly intelligent students did not prefer SRL over other forms of learning, and they did not prefer self-regulated learning more than their peers in the same learning environment. Differences in changes in the preference for SRL in the course of the fourth grade were not associated with intelligence. HLM analyses showed, however, that students in different classrooms differed in their trajectories regarding the preference for SRL. Practical implications and suggestions for future research are discussed.

Keywords: self-regulated learning, intelligence, elementary school students, hierarchical linear models (HLM), longitudinal analysis

Researchers specializing in the field of expertise have long explained exceptional accomplishments primarily as a function of intensive learning processes (cf. Ericsson, Krampe, & Tesch-Römer, 1993). Giftedness researchers, on the other hand, have traditionally based their achievement prognoses largely on personality characteristics, in particular on the learners' cognitive abilities or their intelligence (e.g., Terman & Oden, 1959). More recently, however, giftedness researchers have also started paying more attention to learning processes and, more specifically, to concepts such as self-regulated learning (cf. Stoeger, 2008; Fischer & Stoeger, 2010). Nevertheless, learning processes, including self-regulated learning, are very seldom integrated into definitions of giftedness (e.g., Ziegler, 2005). Rather, personality characteristics (for scholastic and academic achievements primarily intelligence) continue to be viewed as the starting point, while (self-regulated) learning is typically viewed as a mediating variable or catalyst in the attainment of higher achievement (e.g., Fischer, 2008; Gagné, 2005; Heller, Perleth, & Lim, 2005). Consequently, giftedness and self-regulated learning are conceptualized as independent of one another. Giftedness, which is frequently operationalized via intelligence, thus does not need to correlate with a marked preference for, a greater frequency of, or a better quality of self-regulated learning. Nevertheless, the assumption still stands that gifted individuals, usually meaning those identified as highly intelligent, will show a higher rate of self-regulated learning, will be better at it, and will profit more from training programs of self-regulated learning. Extant data on the issue present an inconclusive picture, which can at least be partially explained by experiment designs and methodological shortcomings. With the present study, we seek to contribute to a better understanding of these inconsistent findings. To this end, we conducted an empirical study in which we avoided a number of the methodological shortcomings of earlier studies. As studies of the relationship between intelligence and self-regulated learning rely on various definitions of these constructs, we will briefly state which definitions we base our own study on before describing shortcomings of existing studies.

For this study, we define intelligence as general cognitive ability in the sense of Spearman's g-factor (Spearman, 1904), that is as cognitive ability that is relevant for solving many different cognitive tasks. This definition allowed us to use an intelligence test that correlates highly with many other intelligent tests, thereby increasing the plausibility of generalizations. We understand self-regulated learning as an active process that is characterized by individuals' accepting responsibility for their own learning (cf. Boekaerts, Pintrich, & Zeidner, 2000). Specifically, we base our study on the cyclical process model described in Ziegler & Stoeger (2005), which is based on the social-cognitive approach (Bandura, 1986; Zimmerman, 1995). In this model self-regulated learning is described as a continuous learning process in which individuals repeatedly pass through a cycle with seven phases: After (1) a self-assessment regarding their current state of learning ability and understanding in a given area of learning, (2) individuals set their own learning goals, (3) strategically plan their learning process, (4) implement the chosen learning strategy, (5) monitor the implementation of this learning strategy, (6) and, if necessary, adapt the chosen strategy. Finally, (7) they evaluate the results of their learning process. These evaluations then serve as the basis for the self-assessment when the cycle is traversed anew.

1. Findings and Limitations of Empirical Studies on Intelligence and Self-Regulated Learning

As we mentioned above, research findings on the relationship between intelligence and self-regulated learning are inconclusive (cf. Sontag & Stoeger, 2010, for a detailed discussion). In some aspects of self-regulated learning, highly intelligent individuals demonstrated or reported a higher frequency or greater quality of self-regulated learning compared to individuals of average intelligence while in other aspects there was no difference between these groups (e.g., Bouffard-Bouchard, Parent, & Larivée, 1993; Spörer, 2003; Zimmerman & Martinez-Pons, 1990). In some studies, highly intelligent students reported even lower levels of self-regulated learning (e.g., Dresel & Haugwitz, 2005; Neber & Schommer-Aikens, 2002, in reference to the results of Wolters & Pintrich, 1998).

An interpretation of these heterogeneous results is difficult for several reasons. For example, the studies are based on different conceptualizations of intelligence and self-regulated learning. There also are differences in the operationalization of self-regulated learning. Methods of data collection include, for example, questionnaires (Dresel & Haugwitz, 2005), interviews (Zimmerman & Martinez-Pons, 1990), and think aloud protocols (Bouffard-Bouchard et al., 1993). There are several other limitations. Five of them have received special attention in the design of our study.

1. Sample selectivity. In many studies, groups of individuals were compared that differ not only in their intelligence but also according to their respective learning environments. Ewers and Wood (1993) and Zimmerman and Martinez-Pons (1990), for instance, found that highly intelligent students were superior to students of average intelligence in some subprocesses of self-regulated learning. But because, in both studies, the highly intelligent students had received a special enrichment offer at school, an alternative interpretation needs to be considered: Self-regulated learning might have correlated with the more stimulating school environment offered exclusively to the higher-intelligence group rather than with the level of intelligence.
2. Failure to account for school-, grade-, and classroom-related contexts in statistical analyses. Even in studies with more comparable groups (e.g., groups of students who attend the same type of school) several students are usually drawn from the same classroom and thereby from the same specific learning environment. Students belonging to the same classroom tend to be more similar to each other with respect to relevant variables than students from a random sample (cf. Hox, 2010). This violates the assumption of independence, which many procedures

of statistical analysis require. Even though statistical methods adequately addressing this issue exist, these methods, to our knowledge, were not applied in any study on self-regulated learning and intelligence.

3. Solely examining individual subprocesses of self-regulated learning. A number of studies in the areas of cognitive learning strategies and metacognition research make valuable contributions to our understanding of the relationship between intelligence and important subprocesses involved in self-regulated learning (e.g., Chan, 1996, for cognitive strategies, and Ewers & Wood, 1993, for metacognitive strategies). However, researchers specifically interested in self-regulated learning should use model-based investigative instruments that represent the theoretical approach as a whole and assess all subprocesses of self-regulated learning that are implied in the theoretical model. Only very few investigations of self-regulated learning in giftedness research have taken such an approach (e.g., Bouffard-Bouchard et al., 1993; Spörer, 2003; Zimmerman & Martinez-Pons, 1990).
4. Cross-sectional investigation of the relationship. Most of the studies we identified that investigate the relationship between self-regulated learning and intelligence are cross-sectional in design (for an overview, cf. Sontag & Stoeger, 2010). Thus, the results of these studies do not allow for qualified statements about how intelligence or other factors (e.g., motivation) influence the change in self-regulated learning over time. Longitudinal studies in the area of metacognition (Alexander & Manion, 1996, April, as cited in Alexander & Schwanenflugel, 1996; Van der Steel & Veenman, 2010) as well as intervention studies conducted with students of various intelligence levels (DeJager, Jansen, & Reezigt, 2005; Stoeger & Ziegler, 2005) yield inconsistent results regarding the role of intelligence for the change of self-regulated learning over time. To our knowledge, no research – except for the two intervention studies just mentioned – has been published regarding the role played by intelligence in the change of the various subprocesses of self-regulated learning over time.
5. Focus on older students. A majority of studies focused on students who were eleven years or older (exceptions are, e.g., Alexander & Schwanenflugel, 1994, who examined solely memory strategies; and Schneider & Bjorklund, 1992, who examined self-assessment). The lack of investigation of younger children may reflect the long-held assumption that younger children lacked the metacognitive capabilities necessary for self-regulated learning (cf., for example, Baumert et al., 2000; Lai, 2011). However, some studies show that younger children are capable of carrying out less complex forms of self-regulated learning (e.g., Alexander, Graham, & Harris, 1998; Kron-Sperl, Schneider, & Hasselhorn, 2008; Roebers, Schmid, & Roderer, 2009; summarized in Wigfield, Klauda, & Cambria, 2011).

2. Goals and Research Questions

The goal of our study is to describe the role played by intelligence for the preference for self-regulated learning (as opposed to a preference for externally regulated or impulsive learning) among fourth-graders, that is, nine- to ten-year-old students. This addresses the fifth of the above-mentioned limitations. Our study design includes four further unique characteristics which are intended to address the shortcomings of earlier studies described above. First, an unselected sample of students was examined. Since, in Germany, all students receive the same schooling irrespective of their cognitive abilities through fourth grade, there is no reason to expect intelligence and learning environment to automatically be confounded. Furthermore, among the various school forms in Germany, elementary school (through fourth grade) brings together individuals with the greatest span of cognitive abilities, therefore avoiding the problem of limited variance. Second, in order to account for the fact that students learning in the same classroom are surrounded by a comparable environment and thus may be more similar to each other than students in a random sample, we used hierarchical linear models when conducting our statistical analyses. Third, our measurements of self-regulated learning are model-based, and all subprocesses (as described in the phase model by Ziegler & Stoeger, 2005) were assessed in one instrument. Fourth, contrary to the design chosen in most studies we analyzed our research questions not only using a cross-sectional design but also a longitudinal design. As mentioned above, we investigated fourth-graders in their final year of elementary school. In this period of their education the scholastic demands placed upon students increase, and students are expected to become more and more self-reliant in their learning. Therefore, it seemed plausible to investigate if the students' preference for self-regulated learning changes in the course of fourth grade. Even if, at the beginning of fourth grade, intelligence were irrelevant for students' preference for self-regulated learning, intelligence might influence how much students' preference for self-regulated learning changes. As earlier research indicates that self-regulated learning requires a high level of motivation (e.g., Ames & Archer, 1988; cf. Zimmerman, 2011, for an overview), we also tested if a combination of intelligence and learning motivation influences how the students' preference for self-regulated learning changes. We used cross-sectional data and longitudinal data to answer our questions. Cross-sectional data were collected at the beginning of the school year and were used to answer the following questions about the role played by intelligence in the preference for self-regulated learning among fourth-graders:

Q1. Is there a correlation between intelligence and the preference for self-regulated learning at the beginning of fourth grade?
Q2. Is there a difference between highly intelligent students and average intelligent students with regard to their preference for self-regulated learning at the beginning of fourth grade?

Longitudinal data were collected at the beginning of the school year, eleven weeks later, and again ten weeks after that. They were used to answer the following questions about the role of intelligence for the change in the preference for self-regulated learning among fourth-graders.

Q3. Does the preference for self-regulated learning change in the course of fourth grade?
Q4. Does intelligence predict the change in individuals' preferences for self-regulated learning in the course of fourth grade?
Q5. Does the combination of intelligence and motivation predict the change in individuals' preferences for self-regulated learning in the course of fourth grade?

3. Method

3.1 Design and Procedure

The data set used in the current study is part of a larger data set from a training evaluation study with fourth-grade elementary school students. For the present study, only data from control classes were used, that is, data of students who received regular classroom instruction. Data collection took place at three different points in time (T1, T2, T3): at the beginning of the school year (T1), eleven weeks later (T2) and again ten weeks after that (T3). The testing sessions were scheduled during regular classroom hours and were led by trained research assistants or by the classroom teachers themselves. To answer the research questions of our present study, we only used some of the instruments the students worked on (these are described in the paragraph on instruments in more detail).

3.2 Participants

368 fourth-grade elementary school students from 19 different classrooms in rural or suburban Bavaria (a federal state of Germany) participated in the study at T1. The mean age of these students was 9 years, 9 months (*SD* = 4.85 months). The gender distribution was balanced (184 girls and 184 boys). 20.7% of participating students had a migration background, that is, they themselves and/or at least one of their parents was not born in Germany. One student dropped out of the study after T1, 9 students (2.7% of the sample) missed the testing session at T2 and 11 (3.2% of the sample) missed the testing session at T3, resulting in a relatively low drop-out-rate.

3.3 Instruments

Preference for self-regulated learning was measured at T1, T2, and T3, intelligence and motivation (learning-goal orientation) were measured only at T1.

3.3.1 Preference for Self-Regulated Learning. Preference for self-regulated learning was measured with the 28 items of the "Fragebogen Selbstreguliertes Lernen-7, FSL-7" [Questionnaire of Self-regulated Learning-7] by Ziegler, Stoeger, & Grassinger (2010). The FSL-7 is based on Ziegler and Stoeger's (2005) seven-phase cyclical model of self-regulated learning. Four school-relevant situations are described briefly (studying for school, preparing for the upcoming school year during the summer holidays, preparing for a test at school, catching up on content missed due to illness). In each situation, the students are asked to indicate their preferred approach to learning in each of the seven phases of self-regulated learning (self-assessment, goal-setting, strategic planning, strategy implementation, strategy monitoring, strategy adjustment, outcome monitoring) by choosing one of three alternatives: self-regulated, externally regulated, or impulsive learning. Sample item (Situation 1, phase 2, goal-setting): How do you study for school? a) I set a fixed goal for myself describing what and how much I want to study [self-regulated learning], b) The teacher or my parents ought to tell me which goal I should set for myself [externally regulated learning], c) When studying, I don't set a specific goal for myself. I can rely on my intuition [impulsive learning behavior]. In the present study, the research assistant or the classroom teacher read the four situations and the response alternatives out loud, allowing for everyone, including weak readers, to complete the questionnaire quickly and accurately. To measure preference for self-regulated learning, we calculated scores for each phase as well as an overall score for the whole instrument by counting the frequency with which a child chose self-regulated learning and dividing it by the number of items answered. The scores are reported as percentages. Example: In phase 2, goal-setting, a student chose the self-regulated alternative in 3 of the 4 situations, resulting in a score of 75%. Regarding the entire questionnaire, that same student chose the self-regulated alternative for 13 out of 28 items, resulting in an overall score of 46%. To calculate the internal consistency, both for the overall scale and the seven subscales, we proceeded as if the questionnaire were a test of the preference for self-regulated learning, with the self-regulated alternative coded as the "right" answer and the other alternatives as the "wrong" answer. Table 1 shows the internal consistencies for the overall scale and the seven subscales. A possible explanation for the relatively low reliabilities at T1 may be the students' unfamiliarity with the response mode. At T2 and T3, students were more familiar with the response mode and reliabilities were higher. In addition, the internal consistencies of these scales were expected to be somewhat low, as the construct of self-regulated learning explicitly allows for situation-specific behavior.

Table 1. *Reliabilities (Cronbach's α) for the Preference for Self-Regulated Learning Scales*

Scale	T1	T2	T3
Self-regulated learning (overall)	.82	.91	.92
Self-assessment (phase 1)	.44	.57	.67
Goal-setting (phase 2)	.60	.74	.76
Strategic planning (phase 3)	.46	.63	.73
Strategy implementation (phase 4)	.57	.67	.73
Strategy monitoring (phase 5)	.50	.68	.76
Strategy adjustment (phase 6)	.61	.79	.79
Outcome monitoring (phase 7)	.63	.76	.74

3.3.2 Intelligence. At T1 students completed the German version of Raven's Standard Progressive Matrices (SPM) Test (Heller, Kratzmeier, & Lengfelder, 1998) as a measure of general intelligence. This non-verbal multiple-choice test consists of 60 tasks in which students are asked to select a single item that completes a given pattern of six or eight items. This assessment method is well-suited for group testing and allows for a relatively unbiased measurement of the intelligence of students who are not native speakers. As there are no up-to-date German norms for this test, we labeled the students with scores at or above the 95th percentile within our sample as the "highly intelligent students", all remaining students are referred to as "average intelligent students". The grouping of students is relevant only for answering research question Q2. In all other analyses intelligence is treated as continuous variable. The SPM's internal consistency came to $\alpha = .80$ in our sample.

3.3.3 Learning-Goal Orientation. To measure learning-goal orientation at T1, we used an adaption of the six-item task-goal-orientation scale by Midgley et al. (1998). The adapted scale consists of the common stem "In school, I want…" and six different fragments to complete the sentence, for example: "…to learn a lot of new things". Students were asked to indicate their agreement on a six-point Likert scale, with 1 = not at all true and 6 = very true. The adequacy of this scale for fourth-grade elementary school students had been demonstrated in earlier studies (e.g., Ziegler & Stoeger, 2004). The internal consistency of this scale was satisfactory (Cronbach's $\alpha = .72$).

3.4 Missing Data

Missing data can occur at the instrument level (e.g. when a student misses a testing session) and at the item level (when a student provides answers on a certain instrument in general but omits one or more items). As mentioned in the sample description, less than 3% of students missed whole testing sessions. Therefore, the proportion of missing data at the instrument level was small. Still, we dealt with this kind of missing data by applying the full maximum likelihood estimation (FIML) when analyzing change in the preference for self-regulated learning in HLM. Thereby, data of students who were not present at every single testing session were included in the analyses, and the information they provided was used. This procedure reduces a potential bias due to sample drop-out. At the item level, the proportion of missing values was small, too. At T1, no item had more than 1.9% missing values in the learning-goal orientation scale, and no item had more than 1.4% missing values in the questionnaire on self-regulated learning. After accounting for sample drop-out, there were few missing values in the self-regulation questionnaire at T2 (with a maximum of 0.8% missing values per item) and at T3 (with a maximum of 5.6% missing values per item, whereby the higher number of missing values is mostly caused by the fact that all students in one classroom did not respond to one of the four situations in the questionnaire). As the number of missing values was small (mostly under 5%) and we therefore did not expect substantial biases, we calculated all scale means from the available values (e.g., if a student missed one item, the mean of the remaining items was calculated) and did not impute missing variables[1].

4. Results

Results are given in two sections: (1) First, the situation at the beginning of fourth grade is described by looking at all variables assessed at T1 (preference for self-regulated learning, intelligence, and learning-goal orientation). Next, we describe the correlations between intelligence and the overall preference for self-regulated learning and between intelligence and the preference for self-regulated learning in each phase at T1, taking into account the hierarchical data structure, that is, the fact that students are organized within classes. We conclude this section with the report of differences (or the lack thereof) between highly intelligent and average intelligent students with respect to their preference for self-regulated learning. (2) In the second section we will look at the change in the preference for self-regulated learning throughout the school year. Again, descriptive statistics for the overall preference for self-regulated learning and for the preference for self-regulated learning in the seven phases at T1, T2, and T3 are presented first. Next, we describe the change in the students' preference for self-regulated learning by modeling growth curves in HLM (Raudenbush & Bryk, 2006). We examine – for the overall preference as well as for all seven self-regulation phases separately – if trajectories vary between students. Finally, we analyze if differences between students in their change in the preference for self-regulated learning can be explained by intelligence or by a combination of intelligence and learning-goal orientation.

4.1 Situation at the Beginning of Grade 4 (T1)

Descriptive statistics and intra-class-correlations (ICCs) for all variables included in further analyses are presented in Table 2. For all phases of self-regulated learning, the percentage of the self-regulated learning choice is provided. The intelligence values were in the range expected for students of this age. The seemingly high mean for learning-goal orientation is not unusual for students of this age (cf. Nicholls, 1984; Stoeger & Ziegler, 2008). The values in the ICC column show how much a variable varies between classrooms. This measure can be read as the proportion of total variance that is due to between-classroom variance. All variables vary more between students than between classrooms. For self-regulated learning not more than 6.7% of the variance is between classrooms for any of the self-regulation phases, signaling rather low classroom influences. For intelligence classroom effects are large, for learning-goal orientation medium (cf. Snijders & Bosker, 1999, p. 46, who list values between .05 and .20 as common for educational research). Table 3 shows the bivariate correlations for all variables used in further analyses. As internal consistencies of the self-regulation scales were rather low, we present attenuation-corrected correlations as well.

[1] Also, the imputation of missing values would have involved the estimation of categorical variables in the self-regulation questionnaire (Was self-regulated learning chosen or not in a certain phase and situation?). We are not aware of a procedure that can reliably deal with estimating a large number of categories in one instrument with justifiable effort.

Table 2. *Descriptive Statistics and Intra-Class-Correlations (ICCs) for all Variables Used in Further Analyses*

	Scale Min; Max	Min	Max	*M*	*SD*	ICC
Self-regulated learning (overall)	0;100	0.00	96.43	33.02	19.17	.042**
Self-assessment (phase 1)	0;100	0.00	100.00	41.80	28.81	.002
Goal-setting (phase 2)	0;100	0.00	100.00	30.28	30.84	.066**
Strategic planning (phase 3)	0;100	0.00	100.00	34.85	29.27	.045**
Strategy implementation (phase 4)	0;100	0.00	100.00	31.50	30.50	.067**
Strategy monitoring (phase 5)	0;100	0.00	100.00	26.13	27.50	.002
Strategy adjustment (phase 6)	0;100	0.00	100.00	26.81	30.18	.001
Outcome monitoring (phase 7)	0;100	0.00	100.00	39.81	33.51	.036*
Intelligence	2;60	17.00	56.00	36.67	7.60	.381**
Learning-goal orientation	1;6	2.00	6.00	5.18	0.67	.100**

Note. N = 368 student from 19 different classrooms. ICC = intraclass correlation, i.e. proportion of total variance due to between-classroom variance, chi-square tests were used to test if between-classroom variance is greater 0; ICC and chi-square test computed with HLM 6.08.
* $p < .05$, ** $p < .01$.

Table 3. Bivariate Correlations for all Instruments and Scales Used in Further Analyses

		1	2	3	4	5	6	7	8	9	10
1	Self-regulated learning (overall)	–	**.52**	**.68**	**.73**	**.68**	**.61**	**.58**	**.65**	-.04	**.10**
2	Self-assessment (phase 1)	.87	–	**.19**	**.24**	**.31**	**.25**	**.23**	**.15**	.04	.03
3	Goal-setting (phase 2)	.97	.37	–	**.49**	**.34**	**.27**	**.26**	**.49**	-.01	.08
4	Strategic planning (phase 3)	1.00	.53	.93	–	**.46**	**.33**	**.24**	**.48**	-.04	.06
5	Strategy implementation (phase 4)	.99	.62	.58	.90	–	**.29**	**.26**	**.35**	-.04	.07
6	Strategy monitoring (phase 5)	.95	.53	.49	.69	.54	–	**.45**	**.21**	-.05	.00
7	Strategy adjustment (phase 6)	.82	.44	.43	.45	.44	.81	–	**.15**	-.04	.02
8	Outcome monitoring (phase 7)	.90	.28	.80	.89	.58	.37	.24	–	-.01	**.15**
9	Intelligence	-.05	.07	-.01	-.07	-.06	-.08	-.06	-.01	–	.04
10	Learning-goal orientation	.13	.05	.12	.10	.11	.00	.03	.22	.05	–

Note. N = 368 students from 19 different classrooms. Observed Pearson correlations are presented above the diagonal, correlations corrected for attenuation below the diagonal (cf. Fan, 2003).
Correlations $|r| \geq .10$ are marginally significant at $p < .10$, correlations $|r| \geq .15$ are significant at $p < .01$. Both are set in bold typeface. Significance cannot be tested for disattenuated correlations (Magnusson, 1967; Muchinsky, 1996).

4.1.1 Correlations Between Intelligence and the Preference for Self-Regulated Learning. There were no significant correlations between the preference for self-regulated learning (overall or for individual phases) and intelligence at T1 (p-values were between .31 for strategy monitoring and .79 for goal-setting), and the disattenuated correlations were close to zero (cf. Table 3). However, these analyses do not take into account the hierarchical data structure, that is, the fact that intelligence may play a different role for the preference for self-regulated learning in different classrooms. As shown in Table 2, only a small percentage (6.7%) of the variance in the preference for self-regulated learning (overall or for certain phases) is between classrooms, but a considerable percentage (38.1%) of the variance in intelligence is between classrooms. Because the role of intelligence for the preference of self-regulated learning may vary between classrooms we specified hierarchical models with students at level 1 and classrooms at level 2. Outcome variables were the preference for self-regulated learning overall and for each of the seven phases, resulting in eight different models. All models were estimated with full information maximum likelihood estimation in HLM 6.08. We used the following two-step procedure for all eight models: First, we analyzed an unconditional model, from which we also calculated the ICCs. In a second step, we estimated so called random coefficients models with intelligence as the z-standardized predictor on level 1 (students). Intercepts and slopes were allowed to vary between classes. The model equations for the second step in the analysis are shown in Appendix A.

Accounting for the hierarchical data structure yielded results comparable to the simple bivariate correlations: Intelligence predicted[2] the preference for self-regulated learning neither for the overall score nor for any of the phases of self-regulated learning (*p*-values for the β-weights for intelligence were between .32 for phase 5, strategy monitoring, and .82 for phase 7, outcome monitoring) (Q1). Intelligence did not serve to explain substantial variance between individuals or between classes (all Pseudo $R^2 \leq .03$). The results of the model estimations are shown in Table 4.

[2] We use the term „predicted“ strictly in the statistical sense and do not imply a causal relationship as intelligence and self-regulated learning were both measured at T1.

Table 4. *Results of the 2-Level Analysis for the Preference for Self-Regulated Learning (Overall and Individual Phases)*

	SRL		Phase 1		Phase 2		Phase 3	
	UCM	RCM	UCM	RCM	UCM	RCM	UCM	RCM
Fixed effects								
Intercept (γ_{00})	32.95**	32.98**	41.79**	41.71**	30.42**	30.46**	34.72**	34.84**
	(1.34)	(1.35)	(1.54)	(1.62)	(2.42)	(2.43)	(2.08)	(2.07)
Level 1								
Intelligence (γ_{10})		-.72		1.48		-0.76		-1.41
		(1.11)		(1.60)		(1.81)		(1.73)
Random effects								
Between classes								
SRL (u_0)	15.47**	15.63*	2.29	5.88**	62.83**	63.57**	38.21**	36.08+
Intelligence (u_1)		0.15		2.48+		0.46		2.60
Within classes (r)	350.95	350.41	825.47	818.31	888.62	887.61	815.73	813.66

	Phase 4		Phase 5		Phase 6		Phase 7	
	UCM	RCM	UCM	RCM	UCM	RCM	UCM	RCM
Fixed effects								
Intercept (γ_{00})	31.15**	31.12**	26.12**	26.21**	26.81**	26.34**	39.80**	39.81**
	(2.40)	(2.40)	(1.47)	(1.55)	(1.59)	(1.68)	(2.28)	(2.27)
Level 1								
Intelligence (γ_{10})		-0.58		-1.59		-1.48		-0.44
		(1.84)		(1.47)		(1.82)		(1.91)
Random effects								
Between classes								
SRL (u_0)	62.11**	60.43*	1.83	5.11	0.82	2.43	40.73*	40.00*
Intelligence (u_1)		3.82		3.78		15.02		0.24
Within classes (r)	863.90	862.07	752.09	742.99	907.48	889.41	1079.38	1079.56

Note. SRL = preference for self-regulated learning. UCM = unconditional model. RCM = random coefficients model. All models estimated with FIML-Estimation in HLM 6.08 (cf. Hox, 2010, p. 41). Fixed effects not estimated with robust standard errors, due to small number of level-2 units. Standard errors are in parentheses.

$^{+}$ p < .10, * p < .05, ** p < .01.

4.1.2 Differences Between Highly Intelligent and Average Intelligent Students. To examine whether highly intelligent (at or above the 95th percentile in our sample) and average intelligent (below the 95th percentile in our sample) students differed from each other in their preferred approach to learning, we first examined whether one group chose self/regulated learning (overall or in individual phases) more often than the other. The descriptive results are shown in Table 5. T-tests revealed no significant differences between the two groups of students (*p*-values were between .16 for strategy monitoring and .98 for self-assessment). Effect sizes for the group differences ranged from no effects to small effects; however, all 95% confidence intervals included zero (cf. Table 5; Q2).

Table 5. Group Differences in the Preference for Self-Regulated Learning

	High (n = 21[a])		Average (n = 347)		Effect sizes of group differences	
	M	*SD*	*M*	*SD*	*d*	95 % CI
Self-regulated learning (overall)	30.44	24.32	33.18	18.84	0.12	[-0.31; 0.57]
Self-assessment (phase 1)	41.67	31.95	41.81	28.66	0.00	[-0.44; 0.46]
Goal-setting (phase 2)	30.95	33.45	30.24	30.73	-0.02	[-0.46; 0.42]
Strategic planning (phase 3)	30.95	31.53	35.09	29.16	0.14	[-0.30; 0.58]
Strategy implementation (phase 4)	29.76	28.08	31.60	30.68	0.06	[-0.38; 0.50]
Strategy monitoring (phase 5)	17.86	29.73	26.63	27.32	0.31	[-0.13; 0.75]
Strategy adjustment (phase 6)	28.57	37.32	26.71	29.75	-0.06	[-0.50; 0.39]
Outcome monitoring (phase 7)	33.33	35.65	40.20	33.39	0.20	[-0.24; 0.64]

Note. High = students at or above the 95th percentile in the SPM intelligence test. Average = students below the 95th percentile in the SPM intelligence test. [a] The 21 students were 11 girls and 10 boys. They were form 12 different classrooms with a maximum number of three students per classroom.

4.2 Change Throughout the School Year

4.2.1 Preferences for Self-Regulated Learning for Each Point in Time. The descriptive statistics for the preference for self-regulated learning at T1, T2, and T3 are shown in Table 6. Similar to their preferences at T1, the students chose self-regulated learning as their preferred approach to learning for about one third of all FSL-7 items at T2 and T3.

Table 6. *Descriptive Statistics for the Preference for Self-Regulated Learning at Different Points in Time*

	T1			T2			T3		
	N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
Self-regulated learning (overall)	368	33.02	19.17	358	35.09	25.00	356	33.23	26.52
Self-assessment (phase 1)	368	41.80	28.81	358	43.95	31.82	356	39.77	33.97
Goal-setting (phase 2)	368	30.28	30.84	358	34.31	35.45	356	30.64	35.66
Strategic planning (phase 3)	368	34.85	29.27	357	36.74	33.00	356	34.85	35.33
Strategy implementation (phase 4)	368	31.50	30.50	358	33.22	33.12	356	36.47	36.04
Strategy monitoring (phase 5)	368	26.13	27.50	358	27.70	31.74	356	28.23	34.14
Strategy adjustment (phase 6)	368	26.81	30.18	358	31.15	36.12	356	28.58	35.44
Outcome monitoring (phase 7)	368	39.81	33.51	358	38.55	37.26	356	33.74	35.80

4.2.2 Changes in the Preference for Self-Regulated Learning. The growth curves in Figure 1 could be described by either a constant, a linear trend (linear increase or decrease), or a combined linear and quadratic trend (increase followed by decrease). For each phase we tested which model fit the data best, again using FIML-estimation procedures in HLM 6.08. Time (T1, T2, T3) was modeled as a within student variable at level 1, the student variables (intelligence, learning-goal orientation) were modeled as level-2 variables in all models. Students within the same classroom may share similar trajectories, and these trajectories may vary substantially between different classrooms. Therefore, classroom was included as level-3 variable. Again, eight different models were specified, one with the preference for self-regulated learning (overall) as the outcome variable and seven with the preference for self-regulated learning in each phase as the outcome variable. The steps of data analysis were the same for all eight models: First, we specified an unconditional model without any parameters for change, describing the data as a constant. Next, we added a linear parameter and used the chi-square deviance test to determine if the second model fit better than the first. This was the case for the preference for self/regulated learning (overall) and for all seven phases. In a third step, we introduced the quadratic parameter into the model. If this model fit the data significantly better than the linear model, the combined model was used for further analyses, if not, the linear model was used. The equation for the combined linear and quadratic model is shown in Appendix B.

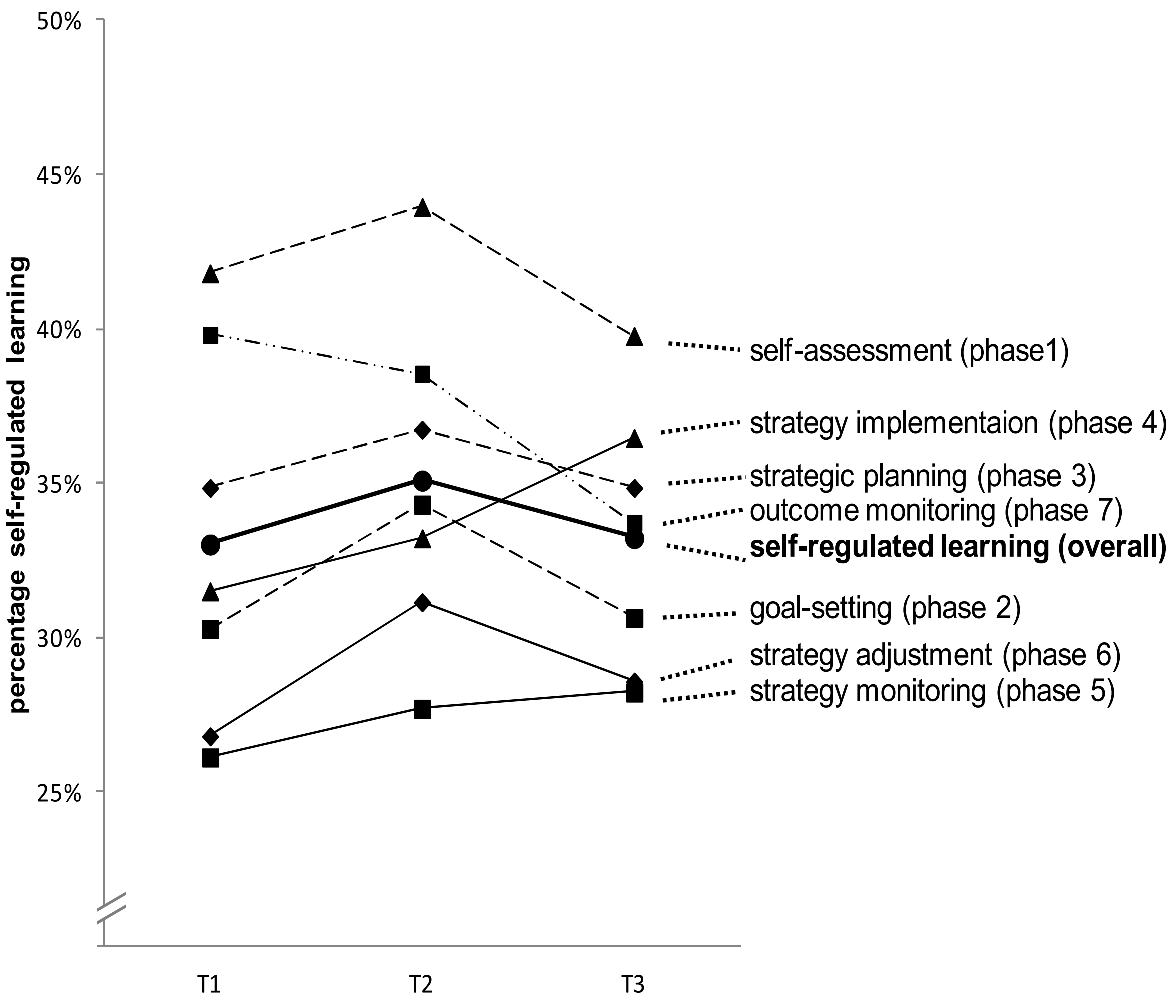

Figure 1. *Percentage of the preference for self-regulated learning for different phases at different points in time*

The data in our sample were not sufficient to estimate this combined linear and quadratic model when all coefficients were allowed to vary between students and between classes. Therefore, we restricted the variation for some parameters: If the reliability estimate for a parameter in the linear model was < .10, we treated the respective parameter as fixed in the quadratic model. If, after this step, the model could not be estimated, we fixed the quadratic Level-3 parameter (β20), and then, if necessary, the quadratic Level-2 parameter (π2). Models with linear and quadratic parameters fit best for self-regulated learning (overall) and for phases 1 through 3. Linear models fit best for phases 4 through 7. As shown in the first panel of Table 7, the coefficients of the linear parameter did not differ significantly from 0, and the coefficients of the quadratic parameter differed significantly from 0 only in the overall model and in the models for phases 1 and 2 (T-Ratio, p < .05). These results confirm the observation based on Figure 1 that there is relatively small change over time (Q3).

4.2.3 Influence of Intelligence, and Intelligence in Combination with Learning-Goal Orientation on the Change in the Preference for Self-Regulated Learning. Hierarchical models can not only be used to describe the change in the whole sample, but also to analyze whether students and/or classrooms differ from each other in the linear or the quadratic parameter[3]. Before we could examine whether intelligence alone (Q4) or in combination with high learning-goal orientation (Q5) influences the change in the preference for self-regulated learning, we had to test if the students differed at all in their trajectories once classroom affiliation was controlled. As shown in the second panel of Table 7, we found level-2 (student-level) variance in the trajectories for the overall preference for self-regulated learning (marginally significant, chi-square test, $p = .083$), for self-assessment (phase 1, chi-square test, $p = .004$) and for strategy implementation (phase 4, chi-square test, $p = .003$). However, the student-level variable intelligence did not explain significant variance in any of these cases (see also Table 7) (Q4). The combination of high intelligence and high learning-goal orientation (Q5) did not explain significant variance in the trajectories either. Due to the limited space these latter non-significant results are not presented in detail. Exploratory analyses with only learning-goal orientation as predictor showed that a high learning-goal orientation – independent of intelligence – influenced the slope for strategy implementation (phase 4): For students whose learning-goal orientation is one standard deviation above the mean, the preference for implementing strategies in a self-regulated way increases 4% more in the course of time than for students with average learning-goal orientation. Analyzing the classroom-level variance in the slope (also shown in the second panel of Table 7), we found significant variance in the change in the overall preference for self-regulated learning as well as in the change in all phases except for phase 6 (strategy adjustment). No specific classroom variables were included in this study. Therefore, variance on the classroom level could not be explained by classroom characteristics. Overall, however, the results show that the preference for self-regulated learning changes differently for students in different classrooms.

[3] Variance in the intercept, i.e., in the mean preference for self-regulated learning between students and/or between classrooms, could be analyzed as well. At T1, we found only little intercept variance at the classroom level. Although we did find large intercept variance at the student level, this variance could not be explained with intelligence as predictor. For this reason, we excluded the analysis of intercept variance from our further analyses. Instead, we focus on the difference in the slope variance, i.e., the change over time.

Table 7. *Results of the 3-Level Analyses for the Preference for Self-Regulated Learning (Overall and Individual Phases of Self-Regulated Learning)*

	SRL		Phase 1		Phase 2		Phase 3	
	UCM	RCM	UCM	RCM	UCM	RCM	UCM	RCM
Fixed effects								
Model for initial status π_0	33.04**	33.04**	41.80**	41.80**	30.52**	-	34.85**	-
Intercept (γ_{000})	(1.37)	(1.36)	(1.50)	(1.50)	(2.40)	-	(2.07)	-
Model for linear change rate π_1	3.74	3.73	4.83	4.84	7.39	-	4.90	-
Linear change rate (γ_{100})	(2.41)	(2.41)	(3.51)	(3.51)	(5.00)	-	(4.43)	-
Intelligence (γ_{110})		0.15		-0.27		-		-
		(0.72)		(0.98)		-		-
Model for quadratic change rate π_2	-2.06*	-2.02*	-3.06*	-3.06	-3.84+	-	-2.62	-
Quadratic change rate (γ_{200})	(1.02)	(1.02)	(1.55)	(1.55)	(2.04)	-	(2.27)	-
Random effects – variance components								
Level-1 variance (over time)								
Temporal variation (e)	245.07	245.07	569.37	569.38	665.70	-	617.34	-
Level-2 variance (between students)								
Individual initial status (r_0)	148.81**	148.81**	257.07**	257.09**	337.59**	-	256.83**	-
Individual linear change rate (r_1)	14.68+	14.63+	54.21**	53.73**	Fixed	-	Fixed	-
Individual quadratic change rate	Fixed	Fixed	Fixed	Fixed	2.48	-	4.07	-
Level-3 variance (between classes)						-		-
Class mean initial status (u_{00})	14.36*	14.35	Fixed	Fixed	55.42**	-	34.55*	-
Class mean linear change rate (u_{10})	24.62**	24.64	35.07**	35.18**	238.05**	-	151.11*	-
Class mean quadratic change rate	Fixed	Fixed	Fixed	Fixed	24.15	-	45.79**	-

(continued)

Table 7 (continued). *Results of the 3-Level Analyses for the Preference for Self-Regulated Learning (Overall and Individual Phases of Self-Regulated Learning)*

	Phase 4		Phase 5		Phase 6		Phase 7	
	UCM	RCM	UCM	RCM	UCM	RCM	UCM	RCM
Fixed effects								
Model for initial status π_0	31.18**	31.18**	26.33**	-	27.71**	-	40.42**	-
Intercept (γ_{000})	(2.11)	(2.11)	(1.40)	-	(1.80)	-	(2.41)	-
Model for linear change rate π_1	2.35	2.32	0.65	-	0.80	-	-3.39+	-
Linear change rate (γ_{100})	(1.63)	(1.63)	(1.55)	-	(1.06)	-	(1.62)	-
Intelligence (γ_{110})		0.66		-		-		-
		(1.03)		-		-		-
Model for quadratic change rate π_2	-	-	-	-	-	-	-	-
Quadratic change rate (γ_{200})	-	-	-	-	-	-	-	-
Random effects – variance components								
Level-1 variance (over time)								
Temporal variation (e)	606.67	606.72	621.17	-	658.73	-	801.20	-
Level-2 variance (between students)								
Individual initial status (r_0)	275.88**	275.86**	168.25**	-	289.89**	-	297.71**	-
Individual linear change rate (r_1)	72.00**	71.53**	19.56	-	25.66	-	6.83	-
Individual quadratic change rate	-	-	-	-	-	-	-	-
Level-3 variance (between classes)				-		-		-
Class mean initial status (u_{00})	42.34**	42.28**	1.37	-	17.31	-	57.05**	-
Class mean linear change rate (u_{10})	29.52**	29.72**	27.55**	-	2.58	-	27.43**	-
Class mean quadratic change rate								

Note. SRL = preference for self-regulated learning. UCM = unconditional model. RCM = random coefficients model with intelligence as predictor of change. All models estimated with FIML-Estimation in HLM 6.08 (cf. Hox, 2010, p. 41). Fixed effects not estimated with robust standard errors, due to small number of level-2 units. Standard errors are in parentheses. The dash (-) in the cells for quadratic change rate means this parameter was not included in the model. The dash (-) in the column for RCM means that random coefficient models were not computed due to little level-2 variation in the change rate.
+ $p < .10$, * $p < .05$, ** $p < .01$.

5. Discussion

The assumption that highly intelligent students prefer self-regulated learning over other forms of learning is still common in the field of gifted education. However, existing research regarding the relationship of intelligence and self-regulated learning yields heterogeneous results. As heterogeneous definitions, inadequate methods, and inappropriate designs make it hard to interpret findings from these studies the goal of our study was to shed more light on this relationship, thereby avoiding several drawbacks of previous studies. We gave clear definitions of both constructs under investigation and used instruments that specifically matched these definitions. Intelligence was defined as g-factor and operationalized via the German version of Raven's Standard Progressive Matrices (Heller et al., 1998), self-regulated learning was based on the definition by Ziegler and Stoeger (2005), operationalized via the preference for self-regulated learning and measured with a theory-based questionnaire (Ziegler et al., 2010). We examined not only the relationship between intelligence and the overall preference for self-regulated learning, but also the relationship between intelligence and all seven phases of self-regulated learning postulated in the theoretical model of self-regulated learning that our study is based on. In contrast to many other studies we used a non-selective sample, that is, the highly intelligent students in our sample did not attend special classes or schools for gifted students but studied in the same learning environment as their peers. This design choice minimizes confounding effects of the learning environment. To nevertheless control for classroom influences we analyzed our data with hierarchical linear modeling (cf. Raudenbush & Bryk, 2006). Although this statistical procedure has been available for quite some time (cf. Hox, 1998), to our knowledge it has not yet been used in the joint examination of intelligence and self-regulated learning.

Moreover, we expanded the cross-sectional design used in existing studies by a longitudinal component. We chose to work with fourth-grade elementary school students who were approximately nine to ten years old. Not only are they from a population that has received little attention in the research literature on intelligence and self-regulated learning so far, but they are also in an interesting phase in their education: In Germany, the country in which this study was conducted, fourth grade is less playful than previous grades, tasks are more challenging and students are expected to become more and more self-reliant in their learning behavior. It seemed reasonable to assume that under these circumstances the students' preference for self-regulated learning could increase. We therefore analyzed if this was the case for all students. Additionally, we examined if the change in students' preference for self-regulated learning was predicted by intelligence or by intelligence in combination with learning-goal orientation.

Taken together, the findings from our cross-sectional analyses do not support the assumption that highly intelligent students prefer self-regulated learning over other approaches to learning. We conducted different types of analyses to answer our first two research questions: First, both simple bivariate correlations and hierarchical linear regressions yielded very small and non-significant relationships between intelligence and the preference for self-regulated learning. This holds true both for the overall preference for self-regulated learning and for the preference for self-regulated learning in all seven phases of the learning cycle (Ziegler & Stoeger, 2005). Second, comparing the most intelligent students (top 5%) with their peers yielded no significant differences in the average preference for self-regulated learning, neither for the overall preference nor for the preference in any of the seven phases. From a methodological point of view, the lack of significant correlations cannot be attributed to restricted variance as the variance in all variables was considerable. Regarding the group comparisons, differences in the mean preference for self-regulated learning might in fact be overlooked due to the small number of highly intelligent students. If, in fact, there were differences, a look at the groups' mean values suggests that it is the average intelligent students who have a higher preference for self-regulated learning.

How do we explain these findings? One explanation could be that highly intelligent students already internalized some aspects of self-regulated behavior and therefore do not remember self-regulated learning as such when asked about it in a questionnaire. To find out if this assumption holds, additional research involving other methods of data collection would be necessary (see Limitations and Future Research). Another quite likely explanation is that a learning environment that is not challenging or complex enough prevents students from self-regulating their learning. This could be the case for all students, but especially for highly intelligent students. If highly intelligent students can solve tasks easily without thoroughly thinking them or the associated learning process through, they could be right in not self-regulating their learning, as it is the most efficient approach to learning in this specific environment (cf. Rabinowitz, Freeman, & Cohen, 1992). In other words, highly intelligent students may avoid the extra effort associated with self-regulated learning when there is no immediate benefit to it. Additional analyses within our sample showed indeed, that the highly intelligent students managed to get better grades than their peers, even though they did not self-regulate their learning more. The assumption that students only self-regulate their learning in challenging environments in which they actually benefit from doing so seems to be supported by the results of other studies. Many studies that show advantages in self-regulated learning for the more intelligent students compared highly intelligent students who attended special schools or tracks for high achievers to students in regular schools or tracks (e.g., Zimmerman & Martinez-Pons, 1990), whereas studies in which no advantage was found looked at students from the same or similar environments (e.g., Dresel & Haugwitz, 2005).

Regarding the longitudinal analyses, we assumed that demands and task difficulties would rise in the course of fourth grade, possibly resulting in an increase in the preference for self-regulated learning among students. As the assumption that intelligent students prefer self-regulated learning is still common in the field of giftedness research we explored the question of whether the preference for self-regulated learning increases more for the more intelligent students in the course of grade four. While it seems plausible to generally assume that more intelligent students adapt better to the more challenging tasks and the changing situation in fourth grade by increasing their self-regulated learning, at the same time, it seems plausible that the preference for self-regulated learning increases more the more learning-goal oriented and intelligent students are.

Contrary to our assumptions, we found that, irrespective of intelligence, the overall preference for self-regulated learning did not increase throughout the school year. In fact, although we observed some change in the preference for self-regulated learning in individual phases, the change itself was small. Although fourth grade is generally seen as more challenging and serious than previous grades, it is conceivable that most students – irrespective of their intelligence – either do not notice the change or do not feel the need to react to it by changing their approach to learning. In addition, students could be more aware of the importance of grades for their school career than we anticipated and therefore might feel it is safer not to experiment with new approaches to learning and/or think they will fare better if they learn exactly as parents or teachers tell them to learn.

The hierarchical regression analyses allowed us to separate the variance in the change in the preference for self-regulated learning that is due to students' belonging to a certain classroom from the variance that is due to individual differences. While we did not see classroom effects in the cross-sectional analyses at the beginning of the school year – suggesting that classrooms did not differ in their promotion of self-regulated learning in the previous years – we did find classroom effects regarding the change in the preference for self-regulated learning in all but one phase (strategy adjustment), indicating that classrooms differed with respect to fostering self-regulated learning in the course of fourth grade. At this point we can only speculate as to why classrooms did not differ in the change of strategy adjustment. One possible explanation could be that none of the teachers paid particular attention to this phase, and therefore students in all classrooms change in similar ways. As we were not primarily interested in classroom effects in this study, we did not measure variables that might explain the classroom effects. We will return to this issue when discussing the study's limitations and suggesting future research.

With the classroom effects statistically controlled, we found individual variance in the change in the preference for self-regulated learning only in the overall measure, in self-assessment (phase 1), and in strategy implementation (phase 4). This is to say that students within the same classroom differ in the degree to which they change their preference for self-regulating these phases. It might be the case that all classrooms provide opportunities for self-assessment and strategy implementation to some extent, and students' characteristics determine if students make use of them. However, intelligence did not explain any of these individual differences in change. The more intelligent students did not develop a more pronounced preference for self-regulated learning, and neither did students with a combination of higher intelligence and higher learning-goal orientation. Exploratory analyses showed that a higher learning goal orientation alone was associated with a stronger increase in the preference for self-regulated strategy implementation (phase 4). This is in line with the theoretical reasoning that self-regulated learning is a taxing activity that requires learning motivation (cf. Pintrich, 2000). However, for the overall measure and for self-assessment (phase 1) learning-goal orientation did not explain individual differences in the change.

Taken together, our results suggest that classroom influences have a greater impact on the change in the preference for self-regulated learning than individual students' characteristics. We believe that this finding is highly relevant in the field of giftedness research in which individuals and their characteristics (such as intelligence) have been the main focus for a long time. By now, learning processes have gained importance, but still the research focus seems to be on the individual.

5.1 Practical Implications

A practical implication of our study is that teachers should be encouraged to integrate elements of self-regulated learning into their regular classroom instruction, thereby fostering self-regulated learning in all – including the highly intelligent – students. While research has already shown that teachers can successfully implement specific training programs over a distinct period of time (Dignath, Buettner, & Langfeldt, 2008), it remains a challenge to find ways in which teachers can permanently create learning environments to foster self-regulated learning on a continuing basis. Drawing on our own results and on the literature (cf. Perry & Rahim, 2011) we believe this implies, first, assigning tasks that are challenging and complex enough to necessitate self-regulated learning, second, supporting students in acquiring, coordinating and practicing self-regulation skills such as self-assessing, goal-setting, strategic planning, strategy use, strategy monitoring, strategy adjustment and outcome monitoring, and third, demonstrating the value of self-regulated learning by drawing attention to the connection between self-regulated learning and achievement.

A second practical implication concerns the fact that we observed a considerable overlap in the preference for self-regulated learning between the highly intelligent and the average intelligent students, and a large variation within each of the two groups. Therefore, we recommend that practitioners diagnose each student's preferred approach to learning individually, for example by applying the FSL-7 (Ziegler et al., 2010). Ideally, practitioners should also talk to students about the reasons for their preferring a certain approach to learning, especially if students prefer impulsive or externally regulated learning behavior. Knowing the students' preferred approach to learning is a good start for systematically improving their learning.

5.2 Limitations and Future Research

Before closing we would like to address some limitations of this study and make suggestions for future research. First, we used a self-report questionnaire to measure the preference for self-regulated learning. Self-report data can be distorted by social desirability, measuring more what students think is expected of them than their actual behavior. However, the following reason alleviates this concern: It is not self-evident that fourth-graders view self-regulated learning as the most socially desirable option. Rather they might think that either listening to parents and teachers or effortless/impulsive learning is more socially desirable. Ergo, if students do view self-regulated learning as the most socially desirable option, this would be a step in the right direction. They might be more willing to self-regulate their learning and be more successful in the long run.

Second, as self-regulated learning is a very complex construct and we wanted to capture all theoretically implied subprocesses in the context of various school-relevant situations, we decided to measure just one aspect of self-regulated-learning, namely the preference for self-regulated learning over externally regulated and impulsive learning. We did not measure the overall frequency of self-regulated actions during actual learning tasks, the quality, or even the adequacy of self-regulated learning behavior. Therefore, we have to be cautious when generalizing our findings to these aspects. Similarly, we succeeded in measuring all theoretically relevant phases with one coherent instrument, but so far have not investigated interconnections between the phases.

We recommend that future research on giftedness and self-regulated learning also include the measurement of self-regulated behavior in real life tasks, for example by using think aloud protocols (cf. Greene, Robertson, & Croker Costa, 2011), computer tools (Azevedo, Johnson, Chauncey, & Graesser, 2011) or video analysis of real classroom instruction (cf. Perry & Rahim, 2011). These methods allow for the observation of the quality and frequency of self-regulated learning as well as for the investigation of interactions between different phases.

Still, we believe that questionnaires remain a useful tool for measuring general preferences or attitudes towards self-regulated learning, especially in large samples. Ideally, all these methods are used in combination, as there is a good chance that they measure slightly different concepts that could tap into different sources of variance when explaining students' achievement gains (cf. Spörer & Brunstein, 2006).

Third, we assumed that the task difficulty would rise in the course of fourth grade, resulting in a greater preference for self-regulated learning among highly intelligent students. However, as we could not actively manipulate the task level, it might be the case that the threshold for task difficulty had not been reached for highly intelligent students – or that even highly intelligent students did not notice the change in difficulty. Therefore, we recommend that the role of changing task difficulty (in relation to a person's cognitive abilities) for self-regulated learning be further explored in an experimental setting.

Finally, although we controlled for classroom effects, we did not measure classroom or teacher variables that could explain them. We already discussed the importance of teachers' providing appropriate tasks for students of all cognitive ability levels. Similarly, other variables of instructional quality such as the provision of support or the use of adequate evaluation practices (cf. Perry & VandeKamp, 2000) could explain different trajectories with regard to self-regulated learning. In addition, variables associated directly with the teacher, such as his or her attitude towards self-regulated learning, should be explored as well. Especially in elementary schools, where students spend most of their time in school with one teacher, teachers' attitudes – manifested in their behavior – could strongly influence how students develop as learners.

To sum up, we presented a study examining the relationship of intelligence and the preference for self-regulated learning, avoiding some methodological and design problems inherent in many empirical studies to date. Highly intelligent students did not prefer self-regulated learning more than their peers in the same learning environment, and differences in the changes in the preference for self-regulated learning in the course of the fourth grade were not associated with intelligence. Interestingly however, students in different classrooms differed in their trajectories of the preference for self-regulated learning. Based on these results we propose that practitioners explore the students' preferred approach to learning individually and irrespective of their intelligence level, and provide opportunities and support for self-regulated learning for all students, including highly intelligent students. Finally, we emphasize the importance of including real learning tasks and classroom variables in future research on giftedness and self-regulated learning.

Appendix A

Equations to Predict the Preference for Self-Regulated Learning by Intelligence

Level 1: $SRL = \beta_0 + \beta_1 \text{ (intelligence)} + r$

Level 2: $\beta_0 = \gamma_{00} + u_0$

$\beta_1 = \gamma_{10} + u_1$

Appendix B

Equations to Model the Change in the Preference for Self-Regulated Learning Over Time

Level 1: $SRL = \pi_0 + \pi_1(T) + \pi_2(T^2) + e$

Level 2: $\pi_0 = \beta_{00} + r_0$

$\pi_1 = \beta_{10} + r_1$

$\pi_2 = \beta_{20} + r_2$

Level 3: $\beta_{00} = \gamma_{000} + u_{00}$

$\beta_{10} = \gamma_{100} + u_{10}$

$\beta_{20} = \gamma_{200} + u_{20}$

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III. Artikel 2

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Gliederung (Artikel 2)

Impact of a Teacher-Led Intervention on Preference for Self-Regulated Learning, Finding Main Ideas in Expository Texts, and Reading Comprehension

Impact of a Teacher-Led Intervention on Preference for Self-Regulated Learning, Finding Main Ideas in Expository Texts, and Reading Comprehension

Abstract. We examined the impact of a teacher-led intervention, implemented during regular classroom instruction and homework, on fourth-grade students' preference for self-regulated learning, finding main ideas in expository texts, and reading comprehension. In our quasi-experimental study with intact classrooms, (a) students (*n* = 266, 12 classrooms) who received regular classroom instruction (REG) were compared with (b) students (*n* = 268, 12 classrooms) who were taught text reduction strategies (TEXT) and (c) students (*n* = 229, 9 classrooms) who were introduced to text reduction strategies within the framework of a 7-step cyclical model of self-regulated learning (SRL + TEXT). Participating classrooms were semi-randomly assigned to 1 of the 3 conditions, with the restriction that teachers from one school could not be in different intervention conditions. Both in their posttest and follow-up test results (11 weeks after the intervention), SRL + TEXT students showed a stronger preference for self-regulated learning than students of the 2 other groups. The SRL + TEXT students also identified more main ideas over the course of the intervention. Positive effects on reading comprehension in a standardized test were restricted to students without migration background.

Keywords: self-regulated learning, strategy instruction, text reduction strategies, reading comprehension, intervention study

Self-regulated learning represents a key skill in our rapidly changing society and one that needs to be taught and practiced as early as possible (Council of the European Union, 2002). The substantial number of effective interventions focusing on self-regulated learning for elementary-school students supports this fact. However, teacher-led interventions produce effect sizes smaller than those of researcher-led interventions (Dignath & Büttner, 2008). Yet teacher-led interventions are particularly important in that they are well suited for encouraging knowledge transfer, as the transfer of self-regulated learning skills from the context in which they were acquired to other domains and contexts works best when the skills are introduced and taught in multiple authentic learning settings (Dignath & Büttner, 2008; Hattie, Biggs, & Purdie, 1996). We, therefore, designed a teacher-led intervention for self-regulated learning for elementary school students that (a) is appropriate for regular classroom instruction and for homework (the two most important scholastic learning settings) and (b) can be applied in multiple subjects.

1. Theoretical and Empirical Background

Meta-analyses indicate that for elementary-school settings, self-regulation interventions based on social cognitive theory are among the most effective (Dignath & Büttner, 2008; Dignath, Buettner, & Langfeldt, 2008). In his frequently cited, social-cognitive-theory-based model, Zimmerman (1989, 2000) divides the self-regulation process into three subsequent phases: a *forethought phase*, a *performance or volitional-control phase*, and a *self-reflection phase*.

The forethought phase encompasses those prerequisite processes that precede actions and learning efforts. The performance or volitional-control phase includes processes that are important during learning and influence one's focus and behavior. During the self-reflection phase, which begins after learning and concludes the cyclical model by Zimmerman (2000), learners evaluate the outcome of their learning. Processes occurring during the self-reflection phase influence the next forethought phase. Each phase within the model brings together numerous cognitive, metacognitive, and motivational aspects (for an overview, cf. Zimmerman, 2000).

By conceptualizing optimal self-regulated learning, models such as Zimmerman's (2000) provide a basis for designing interventions and for conducting research on self-regulated learning. Research findings indicate that acquainting intervention participants with an intervention's theoretical model improves both its effectiveness and transfer (Salomon & Perkins, 1989; Stahl, Simpson, & Hayes, 1992). However, as theoretical models such as that of Zimmerman (2000) include numerous aspects in each phase and are therefore relatively complex, a simplified version should be taught to intervention participants (Stoeger & Ziegler, 2008a, 2011; Zimmerman, Bonner, & Kovach, 1996). Model simplification is, moreover, particularly important when interventions target children in elementary school (Zimmerman, 1990).

For our intervention, we chose a simplified seven-step cyclical normative model of self-regulated learning (Ziegler & Stoeger, 2005) that reflects a limited number of important aspects from the Zimmerman model (cf. online supplemental material, Figure S1). The simplified model stresses those cognitive and metacognitive aspects for which there are promising results from earlier interventions with elementary school students (Dignath & Büttner, 2008; Stoeger & Ziegler, 2008a). This model places less emphasis on motivational aspects, as motivation issues appear to play a greater role in interventions for secondary school students (Dignath & Büttner, 2008). The first three steps of the intervention model represent aspects contained within Zimmerman's (2000) forethought phase. They are *self-assessment*, *goal setting*, and *strategic planning*. The next three steps—*strategy implementation*, *strategy monitoring*, and *strategy adjustment*—represent aspects contained within Zimmerman's (2000) performance or volitional-control phase. These three steps constitute an internal cycle within the larger seven-step cyclical model and can be applied to various cognitive strategies (e.g., organizational strategies, rehearsal strategies; cf. Weinstein & Mayer, 1986). The final step in the seven-step cycle of self-regulated learning, *outcome evaluation*, is derived from the third phase of Zimmerman's (2000) model. As in Zimmerman's (2000) model, this final step influences the way students work through the cycle of self-regulated learning the next time.

In addition to the choice of the underlying theoretical model, several other features of self-regulated learning interventions have been associated with producing particularly large effect sizes. Effect sizes are larger if interventions emphasize the benefit of strategy use and provide systematic feedback (Dignath & Büttner, 2008; Hattie & Timperley, 2007; Schunk & Rice, 1987). Furthermore, evidence indicates that introducing self-regulated learning with concrete subject matter in real-life settings is particularly effective and helpful for improving transfer to other tasks and situations (Dignath & Büttner, 2008; Hattie et al., 1996). Additionally, interventions are especially effective when they simultaneously address both in-class instruction and homework contexts (Ramdass & Zimmerman, 2011; Stoeger & Ziegler, 2011). Finally, the duration of an intervention has an influence on its overall efficacy and the extent to which learners succeed in transferring a given skill from the context in which it was taught into new subject areas and learning contexts (Alexander, Graham, & Harris, 1998; Pressley, Graham, & Harris, 2006).

2. Present Research

We sought to build upon current research findings by developing a 7-week teacher-led training program that students apply during regular classroom instruction and homework. We developed the intervention for fourth grade in accordance with Bavarian state curriculum guidelines that explicitly mandate the introduction of self-regulation skills during fourth grade (Bayerisches Staatsministerium für Unterricht und Kultus, 2000). Basic science[1] and reading instruction were chosen as content areas. Based on the research reported earlier, we make the assumption that introducing self-regulated learning in the context of two school subjects and during in-class instruction and homework should facilitate the transfer of self-regulated learning skills.

In accordance with this content focus, we selected text reduction strategies for Steps 4 through 6 of the seven-step cycle of self-regulated learning. The training program introduces students to three reduction strategies that are useful for identifying and displaying main ideas: *underlining and copying main ideas verbatim*, *drawing a mind map containing main ideas*, and *summarizing main ideas in one's own words*.

We selected these strategies with four reasons in mind: First, we sought to design and implement an ecologically valid intervention. For this reason, we selected those strategies which the state curriculum recommends for regular fourth-grade German instruction in Bavaria (Bayerisches Staatsministerium für Unterricht und Kultus, 2000).

Second, students can effectively learn to use all three of these strategies during regular classroom instruction, and their use of these strategies can lead to improvements in finding main ideas and reading comprehension (for an overview, cf. National Institutes of Child Health and Human Development, 2000; Slavin, Lake, Chambers, Cheung, & Davis, 2009).

Third, as we designed our intervention for regular classrooms with children representing a wide spectrum of ability levels, we were interested in selecting strategies that are appropriate both for average readers (e.g., Bean & Steenwyk, 1981; Griffin, Malone, Kameenui, 1995) and for less advanced readers and students with learning disabilities (Kim, Vaughn, Wanzek, & Wei, 2004; Malone & Mastropieri, 1992).

Fourth, our choice of strategies also reflects findings indicating that teaching these strategies is particularly effective when they are taught in combination with one or more of the other steps covered in the seven-step cycle of self-regulated learning. Main-idea instruction is more effective when it is combined with self-monitoring than when it is presented by itself (Jitendra, Hoppes, & Xin, 2000; Malone & Mastropieri, 1992). Similarly, interventions combining instruction on finding main ideas in texts or on text comprehension strategies with goal setting is more effective than the same interventions without goal setting (Schunk & Rice, 1989; cf., however, Johnson, Graham, & Harris, 1997). Furthermore, evidence documents the superiority of teaching various metacognitive strategies in combination with text strategies in comparison to regular instruction or to teaching only text strategies (Mason, 2004; Souvignier & Mokhlesgerami, 2006). However, to our knowledge, there are no intervention studies in which students learn about a specific model of self-regulated learning and then—with substantive knowledge of the model—work systematically through the individual steps of the model.

While combining the presentation of a normative model with opportunities for practicing the application of the model's steps, our intervention design reflects these insights on effective self-regulated learning interventions. With these goals in mind, we designed a 7-week training program consisting of 2 informational weeks and 5 learning-cycle weeks. During the informational weeks, teachers introduce the seven-step cycle of self-regulated learning and the text reduction strategies mentioned previously. The knowledge presented during the informational weeks is then proceduralized in the five learning-cycle weeks. In other words, once students have understood the basic ideas behind the skills described in the seven-step cycle of self-regulated learning (during the two informational weeks), they then use the learning-cycle weeks to actually start developing these

[1] The subject is called *Heimat- und Sachunterricht* in Bavaria, Germany, and deals with basic aspects of everyday life, including topics from biology, geography, physics, health and social sciences.

skills through practice with specific content (i.e., an expository text of the same length and difficulty level every day) and with the help of various learning materials. For example, participants receive learning journals (cf. Hübner, Nückles, & Renkl, 2010) with which they document their learning behavior, difficulties they encounter, and adjustments they make to their learning strategies (cf. the Method section). The learning journals and various other intervention materials help students to recognize the usefulness of the metacognitive and text strategies introduced in the intervention (Dignath & Büttner, 2008; Schunk & Rice, 1987). To facilitate this process, teachers give feedback and help the students to systematically draw connections between learning behavior and learning achievements (cf. the description in the Method section).

As we mentioned previously, meta-analyses indicate that teacher-led interventions are not as effective as researcher-lead interventions. However, in order to facilitate the transfer of the skills presented in the intervention to everyday practices throughout a child's school and homework activities, it is essential that classroom teachers lead the interventions. To increase the effectiveness of our teacher-led intervention, we placed an emphasis on the initial training of teachers prior to the administration of the program as well as on ongoing support during their implementation of the program. Before conducting the training program in their classrooms, teachers completed 2 full days of training. They also received extensive training materials and a teachers' manual designed to help them and their students avoid the sorts of barriers typically encountered in strategy instruction (cf. Kline, Deshler, & Schumaker, 1992). We also accompanied the administration of the entire 7-week training program (cf. Guskey, 1986).

In the present study, we examined whether the intervention as described leads to effects in students' self-reported preference for self-regulated learning, their ability to find main ideas in expository texts, and their overall reading comprehension. We compared three groups: students who receive regular instruction (REG), students who receive special instruction in text reduction strategies (TEXT), and students who receive instruction in text reduction strategies embedded in a training program focused on the seven-step cycle of self-regulated learning (SRL + TEXT). The comparison between the SRL + TEXT condition and the REG group shows the effect of the entire intervention approach compared with regular classroom instruction. This comparison is especially relevant from a practical perspective. The comparison between the SRL + TEXT condition and the TEXT condition shows the additional benefit of teaching text reduction strategies within the context of a cycle of self-regulated learning. This comparison is especially relevant from a theoretical perspective.

In addition to a summative evaluation with pretest, posttest, and follow-up data collection, we also incorporated a process evaluation (cf. Stoeger & Ziegler, 2008a; Zimmerman, 2008). For the summative evaluation, all three groups of students filled out a learning preferences questionnaire and completed a standardized reading comprehension test at three points in time: before the intervention, directly after its conclusion, and then 11 weeks later. In our process evaluation, we observed whether the number of identified main ideas increased as students in the intervention groups worked on the daily expository texts.

In light of previous research, we expected an increase in the number of identified main ideas for both intervention groups over the course of the training program. We also expected that students in the combined intervention group (SRL + TEXT) would show a greater preference for self-regulated learning in comparison with the students in both other groups, both immediately after the intervention and in the follow-up test. Practicing metacognitive and text reduction strategies simultaneously appears to be more effective than only working on text strategies (cf. Dignath et al., 2008). We thus expected that the number of identified main ideas would increase more for the students in the combined intervention group (SRL + TEXT) over the course of the 7 weeks than it would in the group of students who only received the text strategy intervention (TEXT). As the focus of our intervention was mainly on basic text reduction strategies (cf. Cantrell, Almasi, Carter, Rintamaa, & Madden,

2010) and as standardized reading comprehension tests additionally measure other aspects of reading comprehension not explicitly covered in our intervention, we considered these tests to be transfer measures and expected to find weak to moderate effect sizes for our two intervention groups (cf. Souvignier & Mokhlesgerami, 2006). We expected the best performance in the reading comprehension test for students in the combined intervention group, followed by students in the text-strategy-only intervention group, whom we expected to perform better than students in the regular instruction group.

3. Method

3.1 Participants and Design

Participants were 763 fourth-graders in 33 classrooms in urban, suburban, and rural areas in southern Germany. The students were on average 9.80 years old (*SD* = 0.43); there was even gender distribution (48.89% girls). Among the participating students, 21.23% had a migration background (MB); that is, they themselves or at least one of their parents had not been born in Germany. The most common languages MB students learned as children were (in descending order) Russian, Turkish, Italian, Albanian, Serbian, and Bosnian. None of the students in our sample were rated by teachers as having difficulties understanding spoken German. Table 1 provides additional information about the MB students. As the linguistic backgrounds of the students varied but all were fluent German speakers, we had no a priori expectations about the effect of the students' migration status.

Table 1. *Demographic Information by Treatment Condition*

	Condition			
	SRL+TEXT	TEXT	REG	Total
Demographic information	(*n* = 229)	(*n* = 268)	(*n* = 266)	(*n* = 763)
Mean age in years (*SD*)	9.89 (0.44)	9.80 (0.43)	9.74 (0.40)	9.80 (0.43)
Percentage of girls	48.03	50.75	47.74	48.89
Percentage of MB students (overall)	38.86	8.58	18.80	21.23
Percentage of MB students who				
were not born in Germany	19.77	13.04	22.00	19.50
use German as their primary language at home	47.20	78.26	66.00	57.41
speak German at home at least sometimes	94.38	95.65	96.00	95.06

Note. SRL = self-regulated learning; TEXT = text reduction strategies; REG = regular classroom instruction; MB = migration background (the student and/or at least one of his or her parents were not born in Germany).

In our quasi-experimental study (Gliner, Morgan, & Leech, 2009), students in intact classrooms were recruited via the local education authorities, who also gave us permission to conduct this study. The local education authorities offered all fourth-grade teachers in their district the opportunity to participate in an evaluation study of a classroom-based text-strategy training program as part of their professional development requirements. We semi-randomly assigned interested teachers, all of whom were certified elementary school teachers with at least 10 years of teaching experience to the three conditions (two intervention conditions and one regular instruction condition). When more than one teacher was participating at the same school, we assigned these teachers either to the same intervention condition or to the regular instruction condition, such that teachers were not aware that different versions of the program were being implemented. The teacher sample represented a total of 22 schools, with SRL + TEXT teachers distributed across eight of the schools and TEXT teachers distributed across nine of the schools. Four of the REG teachers taught in the same school as one of the SRL + TEXT teachers, and eight REG teachers taught in schools where there were no intervention-condition teachers. Teachers who were assigned to the regular instruction condition (under the pretense that we had a maximum number of participants and had raffled off the spots) were given the chance to receive the training materials after the evaluation study ended, and we promised them preferential admission to future workshops. At the end of the study, we debriefed all teachers about the study design and offered them feedback on the results of students in their own classrooms. Teachers' and students' participation in the evaluation study was voluntary, and both participants and their parents consented to participation. Teachers also informed the students' parents about the program.

We implemented a pretest (Time 1, or T1), posttest (T2), and follow-up test design (T3) with three conditions: In the final sample, nine[2] classrooms participated in the full training condition, practicing both self-regulated learning and text reduction strategies (SRL + TEXT). Twelve classrooms participated in the text-strategy-only condition (TEXT). The students in this condition received the same training as the full training group, but without the specific self-regulation components of the training. Students from 12 additional classrooms received regular instruction (REG). Table 1 shows our sample's demographic information by treatment condition. The evaluation of our study included two aspects: We conducted a summative evaluation for all three conditions at three measuring points with the help of standardized reading tests and questionnaires; we also carried out a process evaluation in the two training conditions to evaluate the students' progress in finding main ideas in daily texts over the course of the training.

3.2 Procedure

3.2.1 Teacher workshops. Before implementing one of the two versions of the training program (SRL + TEXT or TEXT, see later detailed description), each group of intervention-condition teachers attended a workshop designed to prepare them for administering their respective version of the training program in their classrooms. As teachers were to conduct evaluations in their classrooms themselves, they also learned how to administer the measurement instruments. Teachers in the regular instruction condition (REG) only learned how to administer the measurement instruments. The workshops were held by the first two authors of this report.

The 2-day workshop for the teachers in the SRL + TEXT condition covered theoretical information on text reduction strategies and self-regulated learning on the first day and the specific training program on the second day. Teachers received training materials for their students and discussed how they would administer them in their classrooms. They also received a teachers' manual

[2] Originally, there were 12 participating classrooms in each of the three conditions. In the SRL + TEXT condition, three classroom teachers from one school decided on short notice and for reasons unrelated to the training program not to participate in the program.

documenting the concepts covered in the workshop and containing checklists of the materials to be covered on each day of the program (cf. Stoeger & Ziegler, 2008b).

As teachers in the TEXT condition did not learn about self-regulated learning, their workshop lasted only 1 day. These teachers received exactly the same instruction and material on text reduction strategies as teachers in the SRL + TEXT condition.

3.2.2 Instruction in the three intervention conditions. Instruction was delivered by fourth-grade classroom teachers during regular classroom hours. As the expository texts used in both intervention conditions dealt with topics from the natural sciences, the training was conducted mainly during reading instruction and instruction in basic science. The students in the regular instruction condition received a comparable amount of curriculum-based instruction in reading and basic science. As some classrooms with regular instruction were from the same schools as the training classrooms, we asked teachers in these classrooms not to employ any of the material provided by us for the training classrooms during the study, but to teach their students as they normally would.

Teachers started administering their training program at dates scheduled shortly after the respective workshops. We provided all teachers of all three groups with contact information so that they could contact the first two authors of this report in the event that they were to have further questions regarding the implementation of the respective training program or the evaluation. Teachers in the intervention conditions could also contact their participating colleagues from the same group. Four (SRL + TEXT) or 3 weeks (TEXT) into the training program, we met with teachers in each of the intervention conditions in order to discuss practical issues of administering the program and to answer questions.

3.2.2.1 Training program in the SRL + TEXT condition. Classroom teachers in the SRL + TEXT condition implemented a 7-week program in which students practiced text reduction strategies as an integral part of self-regulated learning exercises (Stoeger & Ziegler, 2008b). The program included daily activities for regular classroom instruction and for homework. By completing the program, the students systematically practiced all phases of the cycle of self-regulated learning described in the Introduction section. The training program consisted of 2 informational weeks and, thereafter, 5 learning-cycle weeks. During the informational weeks, students spent approximately 45–60 min of instruction time per day on the training program. During the learning-cycle weeks, the time spent on the training varied between approximately 40 min on Tuesdays, Wednesdays, and Thursdays and approximately 60 min on Mondays and Fridays.

During the first informational week, students learned why it is important to understand texts, what main ideas are, how they can identify them in expository texts, and how they can differentiate between main ideas and less important passages. Students received a one-page summary on how to identify main ideas; they were encouraged to refer to this summary throughout the program whenever they felt the need to do so. Teachers also presented and modeled three reduction strategies that are useful for identifying and displaying main ideas: (a) underlining and copying main ideas verbatim, (b) drawing a mind map containing main ideas, and (c) summarizing main ideas in one's own words. Students received a one-page summary on each strategy and were given the opportunity to practice each strategy on a short expository text (approximately 200–240 words).

During the second informational week, teachers introduced the self-regulated learning cycle by Ziegler and Stoeger (2005). For the students, the cycle was called the *learning circle* and was illustrated with cartoon-style pictures of Zumpel the Mouse who described all seven phases of the circle as a first-person narrator. Using this instructional material, students created their own learning circles and hung them up at home. Their hand-made learning-circle illustrations as well as the illustrations provided in the training program materials were meant to ensure that students would have frequent and easy access to visualizations of the learning circle and its individual phases while working through the training program. Teachers also used the second informational week to discuss the phases of self-regulated learning with their students; they used various examples drawn from everyday situations such as completing homework or practicing a certain sports skill. At the end of the second informational week, teachers provided their students with information on effective goal setting and discussed common goal-setting mistakes with their students. As students should become aware of the relationship between using learning strategies and achieving goals and as this is a very demanding task for fourth graders, we asked students to set relatively simple quantitative outcome goals. Finally, teachers informed their students about the structure of the training program planned for the upcoming weeks.

During the following weeks, the learning-cycle weeks, the students repeatedly and consciously worked through all phases of the learning cycle. Every school day, students were to read an expository text about a topic from the natural sciences (e.g., fungi and mushrooms; rainbows; desert plants; blood) and then to identify the 10 main ideas. The texts were designed especially for use in the training program and to adhere to the following criteria: Each text was about 420 words long and contained 10 main ideas as well as several distractor sentences (see online supplemental material for a sample text). All texts were of a comparable difficulty level. The texts received a mean score of 69.16 (SD = 3.73) on the German version of the Flesch readability index (Amstad, 1978), which corresponds to the difficulty level found in fifth-grade textbooks. These design criteria were set to ensure (a) that the texts would offer all students—including strong readers—the best possible chance of benefiting from applying, monitoring, and adjusting their strategy use and (b) that all students would be able to establish a clear connection between improved strategy use and better results. During the learning-cycle weeks, students kept a structured learning journal that accompanied them as they progressed through the learning cycle.

At the beginning of each learning-cycle week, students set a specific outcome goal for themselves that specified how many main ideas (10 being the maximum) per daily text they aspired to find. The students were encouraged to set goals for themselves that were challenging but achievable. They noted their goals in their learning journal, and they also wrote down what strategy they planned to use in order to achieve their goal. During learning-cycle Weeks 1–3, one of the three previously introduced text strategies for identifying and displaying main ideas was prescribed by the program per week: underlining and copying verbatim for the first learning-cycle week, mind mapping for the second, and summarizing for the third. This way, all students had the opportunity to practice each strategy systematically. In the remaining 2 learning-cycle weeks (learning-cycle Weeks 4 and 5), students chose strategies that they felt had been particularly helpful during the previous weeks and/or strategies from which they felt they could profit from continued practice of their effective implementation. During each of the 5 weeks, the students used their journals to keep track of how exactly they planned to use the strategy they were focusing on, how their monitoring worked, and what strategy adaptations they made.

In order to help students in the SLR + TEXT classrooms better understand the text strategies introduced during the first training week in the context of self-regulated learning, we incorporated an additional, story-based reading activity into learning-cycle Weeks 1, 2, and 3. We prepared four age-appropriate stories written in a more informal style in which the cartoon character Zumpel the Mouse served as a model of self-regulated learning use. In reading these "self-regulated learning stories," the students accompany Zumpel as the mouse works on the aforementioned strategies: Zumpel self-assesses the learning process (Text 1) and then tries out, monitors, and adjusts the underlining strategy (Text 2), the mind mapping strategy (Text 3), and the summarizing strategy (Text 4).

The students received one expository text per school day. They read the daily text silently and then had the opportunity to ask their peers and teacher about unfamiliar words. Then, before taking the text home and working further with it, they noted in their learning journal how many main ideas they thought they would find in that text (10 being the maximum number). At home, they used that week's strategy to identify and display the main ideas in the text. Students spent between 20 and 30 min on this homework assignment. Right after having finished this part of their homework assignment, they evaluated how well their strategy worked on that day and wrote down in their learning journal how they wanted to improve their strategy use the next day. The next day, the homework assignment was discussed in class. Teachers based this discussion on the sample solutions they had received as part of the teachers' manual. The students noted in their learning journal how many of the main ideas they actually found. In a teacher-class dialogue, the teacher addressed the connection between strategy use and outcome. Students were encouraged to use their experience with the text from the previous day to improve their strategy when working on the next text.

Each Friday, Thursday's homework assignment was discussed first. Then, the students worked on a new text during classroom instruction. After discussing results and strategy use for this new text, the teacher initiated a discussion about learning behavior, strategy use, and results in the current week. We integrated appropriate prompts into the students' learning journals to help facilitate this reflection process. The students thus also took time during classroom instruction on Fridays to summarize the current week in their journals. Based on this summary, teachers discussed the learning behavior with their students and how they could use their experience from this week to improve their learning behavior in the following week.

3.2.2.2 Training program in the TEXT condition. Teachers in the TEXT condition used the same materials and methods as teachers in the SRL + TEXT condition with one exception: They did not employ the materials on or make explicit references to self-regulated learning. As the TEXT-condition teachers did not introduce the concept of self-regulated learning to their students (Informational Week 2 in the SRL + TEXT condition), the duration of the TEXT-condition training program was reduced to 6 weeks. During an informational week, students in the TEXT condition learned—as did the students in the SRL + TEXT condition—why it is important to understand texts, what main ideas are, how they can identify them in expository texts, and how they can differentiate main ideas from less important passages. They also received the one-page summary on how to identify main ideas. Teachers in the TEXT condition also introduced and modeled the same three text reduction strategies used in the SRL + TEXT condition.

Then, during the subsequent five practice weeks, students applied the strategies to one expository text per school day by working to identify the 10 main ideas within each text. As in the SRL + TEXT condition, teachers discussed the correct solutions of this homework assignment with their students. However, students were not encouraged to use any self-regulated learning strategies. Students in the TEXT condition neither read self-regulated learning stories nor kept learning journals. Table 2 shows the two intervention conditions in comparison.

3.2.2.3 Instruction in the REG condition. Students in the REG condition received regular classroom instruction in reading and basic science in accordance with the curriculum. The curriculum explicitly lists the use of text strategies such as underlining, making graphic representations, and summarizing as part of the reading instruction and summarizing basic scientific texts as part of the basic science instruction. Moreover, the legally binding state curriculum of the region where the study was conducted explicitly encourages teachers to emphasize self-regulated learning as the basis for lifelong learning and as a means of transferring more responsibility for the learning process onto the students. Within the confines of the curriculum, teachers in the regular instruction conditions could adjust their teaching to the needs of their students. Students spent between 20 and 30 min on their reading and basic science homework assignments each day.

Table 2. *The Two Intervention Conditions in Comparison*

SRL+TEXT	TEXT
Informational weeks	Informational weeks
Week 1	Week 1
Why understand texts	–
How to find main ideas	–
How to use text reduction strategies	–
Week 2	Week 2
Self-regulated learning	Why understand texts
	How to find main ideas
	How to use text reduction strategies
Learning-cycle weeks	Practice weeks
Daily tasks	Daily tasks
Reading	Reading
Read text	Read text
Use text reduction strategy	Use text reduction strategy
Find 10 main ideas	Find 10 main ideas
SRL	
Self-assessment	–
Strategy monitoring	–
Strategy adjustment	–
Outcome evaluation	–
Weekly tasks (Weeks 3-7)	
SRL	
Goal-setting	–
Strategic planning	–
Outcome evaluation (reflection)	–
Week 3	Week 3
Underlining	Underlining
SRL stories	–
Week 4	Week 4
Mind mapping	Mind mapping
SRL story	–
Week 5	Week 5
Summarizing	Summarizing
SRL story	–
Week 6	Week 6
Applying a text reduction strategy of choice	Applying a text reduction strategy of choice
Week 7	Week 7
Applying a text reduction strategy of choice	Applying a text reduction strategy of choice

Note. SRL = self-regulated learning; TEXT = text reduction strategies.

3.2.3 Treatment fidelity. All teachers indicated in their checklists that they used all training materials with the exception of one teacher who skipped one text due to a school activity day. The student training materials, which we collected from the students after the training programs were over, also suggest that the training programs were delivered as intended. Missing data in the student materials are in the range we expected for a practice period of 5 consecutive weeks. From this evidence and from more information collected in personal communication with teachers, we concluded that the interventions were implemented as intended.

3.2.4 Program evaluation. The testing sessions for the summative evaluation were scheduled during regular classroom hours in the week before the training started (T1), in the week after it concluded (T2), and another 11 weeks later (T3). The sessions were led by trained research assistants or by the specially trained classroom teachers. At T1, students filled out the questionnaire on their preference for self-regulated learning during one 35-min testing session and completed the reading comprehension test and questions on demographic information in another testing session that lasted 25 min. At T2 and T3, the testing sessions lasted 35 min (questionnaire) and 75 min (reading comprehension test), respectively. To ensure comparable testing conditions, teachers and research assistants followed a detailed manual and read out instructions verbatim. The instrument for the process evaluation was integrated into the training material in both intervention conditions. An overview of our measurement schedule is provided as online supplemental material, Table S1.

3.3 Measures

3.3.1 Measures used in the summative evaluation. We measured the preference for self-regulated learning at T1, T2, and T3 with the 28 items of the Fragebogen Selbstreguliertes Lernen–7, or FSL–7 [Questionnaire of Self-Regulated Learning–7] by Ziegler, Stoeger, and Grassinger (2010). The FSL–7 is based on Ziegler's and Stoeger's (2005) seven-step cyclical model of self-regulated learning. In the questionnaire, four school-relevant situations are described briefly: studying for school, preparing for the upcoming school year during the summer holidays, preparing for an in-class test, and catching up on school work after an illness. In each situation, the students are asked to indicate their preferred method of learning for each of the seven steps of self-regulated learning (self-assessment, goal setting, strategic planning, strategy implementation, strategy monitoring, strategy adjustment, and outcome evaluation) by choosing one of three alternatives: self-regulated, externally regulated, or impulsive learning. The following is a sample item (Situation 1, Step 2: Goal setting):

> How do you study for school? (a) I set a fixed goal for myself describing what and how much I want to study [self-regulated learning]; b) My teacher or parents should tell me which goal I should set for myself [externally regulated learning]; c) When studying, I don't set a specific goal for myself. I can rely on my intuition [impulsive learning behavior].

In the present study, the research assistant or the classroom teacher read the four situations and the response alternatives out loud, ensuring that everyone, including weak readers, could complete the questionnaire both accurately and quickly.

In the present study, we restricted our interest to the preference for self-regulated learning. Therefore, we calculated an overall score by counting the frequency with which a student chose self-regulated learning and divided it by the number of items answered. For ease of understanding, the scores are reported as percentages. For example, a student who chose the self-regulated learning option in 13 out of the 28 items would be given a score of 46.43%. The internal consistency came to .85 at T1, .91 at T2, and .93 at T3.

At T1, we measured reading comprehension with the text comprehension section of the Ein Lesetest für Erst-bis Sechstklässler, or ELFE 1–6 [Reading Test for First to Sixth Graders], by

Lenhard and Schneider (2006). In this section of the ELFE 16, students have 7 min to read 13 short texts (15–56 words) and answer a total of 20 multiple-choice questions. According to the authors of the test, students require different levels of reading skills to answer the questions. The skills are: finding information (five items), intersentential reading (eight items), and inferential reading (seven items). For the purpose of this study, we calculated the overall reading score (range: 0–20 points). Cronbach's alpha came to .82 in our sample.

We had originally planned to use the ELFE test at T2 and T3 as well. However, as we encountered unexpected ceiling effects at T1 (39.20% of all students had a score of at least 18 out of 20 points, and 11.33% of all students had a perfect score of 20 points), we decided to use a different, more difficult test at T2 and T3 that was designed to assess similar aspects of reading and text comprehension. We employed the text comprehension section of the Hamburger Lesetest für 3. und 4. Klassen, or HAMLET 3–4 [Hamburg Reading Comprehension Test for Grades 3 and 4] by Lehmann, Peek, and Poerschke (2006), using Version A at T2 and Version B at T3. Time constraints prevented us from employing both the ELFE and the HAMLET.

The text comprehension section of each HAMLET version comprises 10 texts: five expository texts, three so-called functional texts (e.g., recipes and timetables), and two narrative texts; the text length varies between 57 and 592 words. The test was administered in two parts: Students had 25 min to work on Texts 1–4, and after a 5-min break, they had another 40 min to work on Texts 5–10. Students were asked to answer four multiple-choice questions per text. According to the test's authors, students require different levels of reading skills to answer the questions. The skills are: simple finding of information (nine items in Version A, eight items in Version B), targeted finding of information (nine items in Version A, 10 items in Version B), combining/reconstructing (14 items in both Versions A and B), and connecting/inferring (eight items in both Versions A and B). For the purpose of this study, we calculated the overall reading score (range: 0–40 points). Cronbach's alpha came to .90 at T2 and .92 at T3 in our sample.

3.3.2 Measure used in the process evaluation. Students in both the SRL + TEXT and the TEXT conditions were asked to identify the 10 main ideas in each of the 25 texts provided throughout the course of the training program (see previous section "Training program in the SRL + TEXT condition" for details). After the end of training, we collected all of the students' training materials. Trained research assistants checked the number of correctly identified main ideas in each text (range: 0–10 main ideas), using a list of the correct main ideas for each text as a reference. After completing this rating process, we returned the training materials to the students. As a measure for the process evaluation, we used the weekly average of the number of correctly identified main ideas, resulting in five values per student.

3.4 Sample Drop-Out and Missing Data

In terms of the summative evaluation, 13 students (1.7% of the sample) missed the reading test at T1, 26 (3.4%) at T2, and 30 (3.9%) at T3. Of these students, one missed the reading test both at T1 and T3, and seven missed the reading test both at T2 and T3. Eleven students (1.4% of the sample) missed the questionnaire about the preference for self-regulated learning at T1, 25 (3.4%) at T2, and 36 (4.7%) at T3. Of these students, one missed the questionnaire at both T1 and T3, and five both at T2 and T3. To handle missing data appropriately, we used state of the art methods (cf. Graham 2009; Schafer & Graham, 2002). As the program that we chose for the inferential analyses for the summative evaluation, HLM (Hierarchical Linear and Nonlinear Modeling software) Version 6.08 (Raudenbush, Bryk, Cheong, & Congdon, 2011), applies listwise deletion methods even if the full-information maximum-likelihood estimation (FIML) is chosen for regular two-level analyses, we used multiply imputed data sets for all inferential analyses with HLM (for all details regarding HLM analyses, see section “Overview of Statistical Procedures” in Results). A discussion of methods for multiple imputation of multilevel data is beyond the scope of this article but can be found, for example, in van Buuren (2011). We used the WinMICE software (Jacobusse, 2005) to generate five data sets under the hierarchical linear model. WinMICE makes use of a nested Gibbs sampler to estimate the parameters of the multilevel model for individual variables. We then analyzed the five sets simultaneously with HLM.

We received training materials from 476 of the 497 students in both training groups (221 SRL + TXT, 255 TXT) for use in the process evaluation; 233 students completed all texts, 61 students missed only one text, 157 students missed two to seven texts, and 25 students missed eight to 13 texts. Data of all students were included in further analyses. In terms of the different texts, there were between 2.9% and 22.1% missing data per text, with missing data below 10% for the first 18 texts and over 20% for only one of the texts in the final week of the training. To ensure consistency with our summative evaluation, we multiply imputed the missing data for the number of correctly identified main ideas with the WinMICE software. We then analyzed the five imputed data sets simultaneously with HLM.

4. Results

4.1 Descriptives and Zero-Order Correlations

Table 3 shows descriptive statistics, proportions of between classroom variance (the intraclass correlation, or ICC), and bivariate Pearson correlations for all measures used in the summative evaluation. The ICC indicates “the proportion of variance in the outcome that is between groups” (Raudenbush & Bryk, 2002, p. 36) rather than between individuals. Students chose self-regulated learning as their preferred approach to learning for slightly more than one third of all FSL–7 items. The rather large standard deviation indicates large differences between students. Right after the training, a small portion (7.57%) of the variance was located between classrooms, rising to a medium portion (16.23%) at follow-up. Students scored on average 15.57 points in the ELFE reading comprehension test, which is slightly higher than fourth graders in the norm sample (cf. Lenhard & Schneider, 2006). In the HAMLET reading comprehension tests, students also scored slightly better than students in the norm sample (cf. Lehmann et al., 2006). For both data-collection points, the proportion of variance between classrooms in the HAMLET was small (7.48% and 3.78%). The measures of self-regulated learning at different data-collection points were correlated, as were the measures of reading comprehension at different data-collection points; the preferences for self-regulated learning and reading comprehension were not correlated. Table 4 contains means and standard deviations for the dependent variables, listed separately for each condition and data-collection point. Both original values and *z*-transformed values are presented.

Table 5 contains descriptive statistics for the process evaluation. Both training groups started with slightly more than six correctly identified main ideas on average in the first week, with a slight advantage for the students in the TEXT condition. Over the course of the training program, students in the SRL + TEXT condition increased the number of correctly identified main ideas from week to week, suggesting a linear increase, whereas the number of correctly identified main ideas seems to remain rather constant in the TEXT condition.

Table 3. *Descriptive Statistics, Proportions of Between Classroom Variance, and Bivariate Pearson Correlations*

		Scale	*M*	*SD*	ICC	1	2	3	4	5
1	Preference for self-regulated learning (T1)	0–100	35.99	20.89	–	–				
2	Preference for self-regulated learning (T2)	0–100	38.17	25.66	7.57%	.61**	–			
3	Preference for self-regulated learning (T3)	0–100	39.64	28.86	16.23%	.49**	.68**	–		
4	Reading comprehension (T1, ELFE)	0–20	15.57	3.51	–	.06	.06	.05	–	
5	Reading comprehension (T2, HAMLET A)	0–40	28.36	6.03	7.48%	-.03	-.00	.03	.58**	–
6	Reading comprehension (T3, HAMLET B)	0–40	29.54	5.68	3.78%	-.03	.02	.04	.56**	.68**

Note. ICC = intraclass correlation. T1 = Time 1; ELFE = Ein Lesetest für Erst- bis Sechstklässler [Reading Test for First to Sixth Graders; Lenhard & Schneider, 2006]; HAMLET = Hamburger Lesetest für 3. Und 4. Klassen [Hamburg Reading Comprehension Test for Grades 3 and 4; Lehmann, Peek & Poerschke, 2006].
**p < .01, two-tailed.

Table 4. *Descriptive Statistics per Condition and Point of Measurement*

		T1			T2			T3		
		n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
		Original values								
Preference for self-regulated learning	SRL+TEXT	228	38.15	21.53	222	44.47	27.79	216	49.43	30.49
	TEXT	261	36.64	21.67	257	37.70	24.48	253	38.71	27.98
	REG	263	33.48	19.30	259	33.14	23.74	258	32.34	25.94
Reading comprehension	SRL+TEXT	225	15.42	3.76	218	27.83	6.41	213	28.92	6.10
	TEXT	262	15.38	3.46	262	28.59	5.93	261	29.75	5.89
	REG	263	15.90	3.34	257	28.58	5.80	259	29.83	5.04
		z-transformed values								
Preference for self-regulated learning	SRL+TEXT	228	0.10	1.03	222	0.25	1.08	216	0.34	1.06
	TEXT	261	0.03	1.04	257	–0.02	0.95	253	–0.03	1.97
	REG	263	–0.12	0.92	259	–0.20	0.93	258	–0.25	0.90
Reading comprehension	SRL+TEXT	225	–0.04	1.07	218	–0.09	1.06	213	–0.11	1.07
	TEXT	262	–0.05	0.98	262	0.04	0.98	261	0.04	1.04
	REG	263	0.09	0.95	258	0.04	0.96	259	0.05	0.89

Note. SRL = self-regulated learning; TEXT = text reduction strategies; REG = regular classroom instruction.

Table 5. *Descriptive Statistics for Number of Correctly Identified Main Ideas per Condition and Week*

	Number of correctly identified main ideas														
	Week 1			Week 2			Week 3			Week 4			Week 5		
Condition	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
	Original Values														
SRL+TEXT	220	6.05	1.78	219	6.10	1.77	218	6.72	2.07	218	6.72	1.99	220	7.30	1.78
TEXT	255	6.24	1.54	253	5.58	1.63	255	6.57	1.58	251	6.19	1.71	244	6.44	1.72
	z-transformed values														
SRL+TEXT	220	–0.06	1.07	219	0.16	1.03	218	0.04	1.13	218	0.15	1.07	220	0.25	0.99
TEXT	255	0.05	0.93	253	–0.14	0.95	255	–0.04	0.87	251	–0.13	0.92	244	–0.23	0.96

Note. SRL = self-regulated learning; TEXT = text reduction strategies.

4.2 Preliminary Analyses

We used chi-square tests (for percentage data) and univariate analyses of variance (to compare means) to examine whether the three groups were comparable with regard to their demographic composition and their pretest scores. The groups did not differ significantly in their gender distribution (p = 75; SRL + TEXT = 48.03%, TEXT 50.75%, REG 47.74% female) but differed significantly in the proportion of students with migration background (MB; p = .00; SRL + TEXT 38.86%, TEXT 8.58%, REG 18.80%; using the Bonferroni correction, all three pairwise comparisons showed significant differences) and with regard to the students' mean age (p = .00; SRL + TEXT: 9.89 years; TEXT: 9.80 years; REG: 9.74 years; the Bonferroni post hoc test showed that only SRL + TEXT differed significantly from REG, but TEXT did not differ from the other two conditions). The groups differed in terms of preference for self-regulated learning (p = .04; again, the only significant difference in the Bonferroni post hoc test was between SRL + TEXT and REG) but did not differ significantly in terms of reading comprehension pretest scores (p = .18; for means and standard deviations, cf. Table 4). To control for these individual variables, we included them as covariates in all inferential analyses.

4.3 Overview of Statistical Procedures

As we recruited students in intact classrooms for this study, we used hierarchical linear models (Raudenbush & Bryk, 2002) to analyze our data. This method takes into account the fact that students within a classroom are more similar to each other than are randomly selected students and estimates standard errors associated with the regression coefficients in an appropriate way. We conducted all analyses with the software package HLM (Version, 6.08; Raudenbush et al., 2011), using the FIML algorithm for model estimations.

4.3.1 Summative evaluation. For the summative evaluation, we were interested in assessing the program's effects on the students' preference for self-regulated learning and on their reading comprehension immediately after the training and 11 weeks later. Therefore, we specified four sets of models (two dependent variables x two time points) in which we regressed the respective individual outcome variable on individual (Level 1) and classroom (Level 2) predictors. As all students from one classroom were in the same training condition, we specified the training condition on the classroom level.

We calculated four models for each set. We used the unconditional model (Model 0) to calculate the intraclass correlation (ICC) of the outcome variable. In Model 1, we included all Level-1 covariates, namely, gender, age, MB, pretest score in the preference for self-regulated learning, and pretest score in reading comprehension. In a first step, we allowed intercepts and slopes to vary between classrooms. In a second step, we fixed slopes if they did not vary significantly (p < .10) between classrooms or if the reliability of the variable was less than .10 (cf. Cheung & Keeves, 1990). This model served as a reference model for the other two models, which include Level-2 variables. In Model 2, we calculated the effects of the two training conditions after controlling for individual variables. To this end, we included two dummy variables, SRL + TEXT and TEXT, to specify a classroom's adherence to a certain treatment condition, making the REG group the reference group. Again, we let slopes vary freely first and fixed them if they did not vary between classroom or if reliability was low. We calculated Model 3 to account for the fact that classrooms and training conditions differed substantially in their proportions of MB students. For this reason, we added the proportion of MB students as a Level-2 covariate. Model 3 shows the training effects for classrooms with an average proportion of MB students.

We report fixed effects based on model estimation with robust standard errors. As the software package HLM Version 6.08 does not provide standardized beta coefficients, we standardized all continuous variables (measures of reading comprehension and preference for self-regulated learning) before entering them into the models for easier interpretation of effects. The intercept of the regression equations can now be interpreted as the mean for a male student without MB who is of average age and with an average preference for self-regulated learning and an average reading score; and the slope coefficients show by how much the dependent variable changes in terms of proportions of a standard deviation if a predictor changes by one unit.

4.3.2 Process evaluation. The process evaluation was conducted to examine whether students in both training conditions identified an increasing number of main ideas across the course of the training. We assumed that students in both training conditions would become more proficient as the training progressed and that the increase in the number of correctly identified main ideas would be greater for the students in the SRL + TEXT condition. After inspecting the descriptive statistics for both groups, we used a linear growth model (cf. Raudenbush & Bryk, 2002) to predict the weekly average number of correctly identified main ideas with the five time points per student on Level 1, students on Level 2, and classrooms on Level 3. We used the original metric (number of correctly identified main ideas) for the outcome variable (as opposed to z-standardized values) to allow for the modeling of actual growth. All continuous covariates were z-standardized. We coded the time points from 0 (Week 1) to 4 (Week 5) so that a coefficient of 0 for the linear time parameter yields the initial status, that is, the average number of correctly identified main ideas during the first of the five learning-cycle weeks. The weekly growth rate (slope) is indicated by the value for the linear time parameter. In a manner similar to our approach in the summative evaluation, we modeled student characteristics as covariates on the student level (here, Level 2) and the training condition as a dummy variable on the classroom level (here, Level 3).

Also in a manner similar to the procedure in the summative analysis, we calculated four models. From the unconditional model (Model 0), we took estimates for the variance components in both the intercept (initial status; number of correctly identified main ideas) and the slope (weekly increase in the number of correctly identified main ideas). In Model 1, we included all student-level covariates, namely, gender, age, MB, pretest score in the preference for self-regulated learning, and pretest score in reading comprehension, both for the intercept and the slope. We allowed all covariates to vary between classrooms in a first step but fixed them using the same criteria as in the summative evaluation in a second step. We also used this procedure for the two remaining models. Model 1 served as the reference model for Models 2 and 3, in which we included classroom variables. In Model 2, we included training condition as predictor on the classroom level. As we compared only the two training conditions with each other in this analysis, one dummy variable (SRL + TEXT) was sufficient. Thus, the TEXT group became the reference group in this analysis. Finally, we also controlled for the proportion of MB students per classroom in Model 3.

4.4 Summative Training Effects

We present the results of the hierarchical regression analyses in two sections. First, we describe the results regarding the students' preference for self-regulated learning, both right after the training and 11 weeks later. Second, we present the results regarding the students' reading comprehension, again for both the posttest and the follow-up test.

4.4.1 Preference for self-regulated learning. The results of the two-level analyses of the preference for self-regulated learning are presented in Table 6, with posttest results in the upper half and follow-up results in the lower half. Model 1 serves as a reference model and contains only individual input variables. As expected, the preference for self-regulated learning at T1 is a strong predictor for the preferences for self-regulated learning both at T2 and T3. In addition, there is a trend indicating that girls' preference for self-regulated learning generally increased more from T1 to T2 than that of boys. We did not, however, find the same effect at T3. At T3, the preference for self-regulated learning was instead slightly higher for older than for younger students. When we introduced classroom-level predictors in Models 2 and 3, the values of the individual predictor variables remained roughly the same. In Model 2, we found a small effect of the combined training condition (SRL + TEXT) on the students' preference for self-regulated learning at the posttest and a medium effect at follow-up. As expected, there were no significant training effects on the preference for self-regulated learning for the TEXT condition. Inclusion of the training conditions as predictors in the model explained almost 40% of the classroom-level variance in Model 1 for the posttest and almost 35% for the follow-up test. Controlling for the proportion of MB students per classroom in Model 3 enhanced the effects of the SRL + TEXT training condition both at posttest and follow-up. The proportion of explained classroom level variance rose to over 45% at the posttest and to over 41% at the follow-up test.

4.4.2 Reading comprehension. Table 7 shows the results of the two-level analyses for reading comprehension. In Model 1, the pretest reading comprehension scores strongly predict reading comprehension scores both at the posttest and at the follow-up. By contrast, MB students scored significantly and considerably lower on the reading comprehension test at the posttest and at the follow-up, even though the pretest scores were controlled. In addition, younger students scored slightly better both at the posttest and at the follow-up test. Finally, girls achieved slightly better reading scores than boys at the follow-up. The values of the individual predictor variables changed very little when we introduced classroom-level predictors in Models 2 and 3. Introducing the training conditions in Model 2 did not unveil any training effects on reading comprehension. Neither the SRL + TEXT condition nor the TEXT condition had a positive effect on students' reading comprehension, and that is true for both the posttest and the follow-up test. The introduction of the intervention variables explained only a very small portion of the Level-2 variance in Model 1 (3.64% for the posttest and 0.55% for the follow-up test). However, when we added the proportion of MB students as class-level predictor, the effectiveness of the combined training program emerged. In that case, students in the SRL + TEXT condition scored significantly higher for reading comprehension than students in the other two conditions at posttest. At follow-up, the effect remained visible as a trend (p = .06). In Model 3, some of the Level-2 variance in Model 1 is explained (21.27% for the posttest, 15.82% for the follow-up).

Table 6. *Results of the Two-Level Analyses for the Preference for Self-Regulated Learning*

	SRL at Posttest (T2)					
Parameter	Model 1		Model 2		Model 3	
	b*	*SE*	b*	*SE*	b*	*SE*
Intercept	–0.05	(0.06)	–0.16	0.08	–0.17	(0.08)
Level 1						
Pretest SRL	0.60*	(0.03)	0.60*	(0.03)	0.60*	(0.03)
Pretest reading	0.04	(0.03)	0.03	(0.03)	0.03	(0.03)
Gender female	0.09^{+}	(0.06)	0.09^{+}	(0.06)	0.09^{+}	(0.06)
Migration	0.00	(0.09)	–0.04	(0.09)	–0.02	(0.09)
Age	0.03	(0.03)	0.02	(0.03)	0.02	(0.03)
Level 2						
SRL+TEXT			0.33*	(0.11)	0.39*	(0.13)
TEXT			0.06	(0.10)	0.03	(0.10)
Migration (agg.)					–0.07	(0.05)
R^2 Level 1	37.53%		37.52%		37.52%	
R^2 Level 2	–		39.47%		45.18%	
Deviance	1778.00		1769.09		1767.37	

	SRL at Follow-Up (T3)					
Parameter	Model 1		Model 2		Model 3	
	b*	*SE*	b*	*SE*	b*	*SE*
Intercept	–0.04	(0.07)	–0.25	0.16	–0.27	(0.11)
Level 1						
Pretest SRL	*0.46**	*(0.03)*	*0.46**	*(0.03)*	*0.46**	*(0.03)*
Pretest reading	0.04	(0.03)	0.03	(0.03)	0.03	(0.03)
Gender female	0.07	(0.06)	0.08	(0.06)	0.08	(0.07)
Migration	–0.04	(0.07)	–0.08	(0.08)	–0.04	(0.08)
Age	0.10*	(0.03)	0.09*	(0.03)	0.09*	(0.03)
Level 2						
SRL+TEXT			0.53*	(0.15)	0.68*	(0.15)
TEXT			0.18	(0.15)	0.11	(0.14)
Migration (agg.)					–0.14*	(0.07)
R^2 Level 1	25.32%		25.15%		25.17%	
R^2 Level 2	–		34.37%		41.17%	
Deviance	1871.00		1859.91		1856.32	

Note. *N* = 763 students from 33 classrooms. Values for Level-1 variables are set in italics if slopes varied freely between classrooms. Variance-explained statistics were computed from the variance components with

$R^2_{L\,eve1\text{-}1}$ = (σ^2 (unconditional model) - σ^2 (fitted model)) / σ^2 (unconditional model)

$R^2_{Leve1\text{-}2}$ = (τ_{00} (Model 1) - τ_{00} (Model with Level-2 variables)) / τ_{00} (Model 1).

$^{+}p < 0.10$, $^{*}p < .05$

Table 7. *Results of the Two-Level Analyses for Reading Comprehension*

	Reading at Posttest (T2)					
Parameter	Model 1		Model 2		Model 3	
	b*	*SE*	b*	*SE*	b*	*SE*
Intercept	0.04	(0.06)	0.02	(0.08)	-0.00	(0.08)
Level 1						
Pretest SRL	–0.01	(0.03)	–0.02	(0.03)	–0.01	(0.03)
Pretest reading	*0.56**	*(0.37)*	*0.56**	*(0.04)*	*0.56**	*(0.04)*
Gender female	0.10	(0.06)	0.10	(0.06)	0.10	(0.06)
Migration	*–0.41**	*(0.10)*	*–0.42**	*(0.10)*	*–0.38*	*(0.10)*
Age	–0.05^{+}	(0.03)	–0.06	(0.03)	–0.06	(0.03)
Level 2						
SRL+TEXT			0.06	(0.12)	0.19*	(0.09)
TEXT			0.03	(0.09)	–0.05	(0.09)
Migration (agg.)					–0.15*	(0.06)
R^2 Level 1	42.22%		42.21%		42.30%	
R^2 Level 2	–		3.64%		21.27%	
Deviance	1744.08		1743.70		1736.27	
	Reading at Follow-Up (T3)					
Parameter	Model 1		Model 2		Model 3	
	b*	*SE*	b*	*SE*	b*	*SE*
Intercept	0.00	(0.06)	0.02	(0.06)	–0.04	(0.07)
Level 1						
Pretest SRL	–0.06*	(0.03)	–0.06*	(0.03)	–0.05*	(0.03)
Pretest reading	0.57*	(0.04)	0.57*	(0.04)	0.57*	(0.04)
Gender female	*0.14*$^{+}$	*(0.08)*	*0.15*$^{+}$	*(0.08)*	*0.15*$^{+}$	*(0.08)*
Migration	*–0.32**	*(0.09)*	*–0.32**	*(0.10)*	*–0.25**	*(0.11)*
Age	–0.05^{+}	(0.03)	–0.05^{+}	(0.10)	–0.05^{+}	(0.03)
SRL+TEXT			0.04	(0.08)	0.13^{+}	(0.07)
TEXT			0.03	(0.08)	–0.04	(0.10)
Migration (agg.)					–0.12*	(0.04)
R^2 Level 1	40.37%		40.37%		40.51%	
R^2 Level 2	–		0.55%		15.82%	
Deviance	1781.08		1780.81		1773.97	

Note. *N* = 763 students from 33 classrooms. Values for level-1 variables are set in italics if slopes varied freely between classrooms. Variance-explained statistics were computed from the variance components with

$R^2_{L\ eve1\text{-}1}$ = (σ^2 (unconditional model) - σ^2 (fitted model)) / σ^2 (unconditional model)

$R^2_{Leve1\text{-}2}$ = (τ_{00} (Model 1) - τ_{00} (Model with Level-2 variables)) / τ_{00} (Model 1).

$^{+}p < 0.10$, $^{*}p < .05$.

4.5 Process Training Effects

The variance decompositions into within- and between-school components in Model 0 showed significant variation among children within classrooms and significant variation between classrooms both for initial status and for the weekly growth rate. For initial status, 16.34% of the variance was between classrooms, and for the weekly growth rate, 29.81%. The fact that classrooms differed more over the course of time than in initial status is not surprising: As the classrooms were assigned to different treatment conditions, different growth rates were to be expected.

The results of the growth model analysis estimating the increase of correctly identified main ideas in both training conditions are displayed in Table 8. In Model 1, only individual student characteristics were included. Reading pretest scores and gender positively predicted initial status, meaning that students with higher reading test scores as well as girls identified more main ideas correctly in the first week of the training. None of the individual covariates significantly predicted the linear trend in the course of the training, although there was a very small trend showing that the number of correctly identified main ideas increased less in the course of the training for older students. Introducing classroom level variables into the model in Models 2 and 3 did not appreciably change the values of the individual predictors. Model 2 shows that the number of correctly identified main ideas in the first week was not predicted by treatment condition, indicating no significant differences between the SRL + TEXT and the TEXT group at the start of training. For the slope, we found a small effect for the SRL + TEXT condition: For students in this group, the number of correctly identified main ideas increased by roughly one third (0.10 + 0.21 = 0.31) of a main idea per week; in the TEXT condition, on the other hand, the number of correctly identified main ideas increased by only one tenth (0.10) of a main idea per week. The model estimated that by Week 5, students in the SRL + TEXT condition identified an average of 1.24 main ideas more than in Week 1, whereas students in the TEXT condition identified, on average, only 0.40 main ideas more than in their first week of training. These results remained stable when we controlled for the proportion of MB students per classroom in Model 3. The training condition remained the sole significant predictor of the growth rate in the course of the training and explained almost 50% of the between-classroom variance in the slope.

5. Discussion

The current study was conducted with two main aims. From a theoretical perspective, the purpose was to assess the additional benefit of teaching text reduction strategies embedded in a training program focused on a normative model of self-regulated learning that students systematically study and proceduralize. To this end, we compared one group of students who learned text reduction strategies while also working on a self-regulated learning training routine (SRL + TEXT) with a second group who completed a training program focused exclusively on text reduction strategies (TEXT). From a more practical perspective, the purpose of this study was to examine the benefit of teacher-led text-reduction strategy interventions (SRL + TEXT and TEXT) compared with regular classroom instruction (REG).

Our results generally confirm the effectiveness of the SRL + TEXT intervention and the advantage of this combined intervention over the pure text reduction strategy intervention (TEXT) and over regular classroom instruction (REG). In particular, the following findings apply to the three dependent variables we studied: First, as expected, both intervention groups showed linear increases in the number of main ideas identified in expository texts over the course of the respective intervention. We observed greater increases among the students in the combined intervention group (SRL + TEXT) than among those in the text-reduction-strategy-only group (TEXT). During the final week of the intervention, children in the combined intervention group identified almost one main idea more per expository text than the children in the text strategy-only intervention group. This finding is consistent with the results of meta-analyses indicating that children in grade school, in particular, do best when they have the chance to work on a combination of cognitive and metacognitive strategies (Dignath et al., 2008). Other studies with a comparable evaluation design (e.g., Stoeger & Ziegler, 2008a) have also revealed continuous improvements across an entire 5-week span of training. But unlike earlier studies, our current study documented training improvements that did not decline at the end of the intervention. This result suggests that the students' grasp on the text reduction strategies continuously improved and that they were also sufficiently motivated to continue using these strategies through to the very end of the training phase.

Second, these effects on finding main ideas in texts only transferred to higher scores in standardized reading comprehension tests in classrooms with no more than an average proportion of MB students. Further analyses comparing only students *without* a migration background revealed treatment effects in the standardized reading comprehension test in the combined intervention condition (SRL + TEXT). Non-MB students in the SRL + TEXT group demonstrated better reading comprehension at the posttest (Cohen's d = 0.25) than the non-MB students in the group with regular classroom instruction. This advantage remained at the follow-up measurement, although it became less substantial (Cohen's d = 0.10). Students with MB in this intervention group performed nearly as well at mastering the skill of finding main ideas as those without MB, but the MB children were largely unsuccessful at applying this skill in the new context of reading comprehension in the standardized tests. One possible explanatory factor might be vocabulary deficiencies, especially concerning specific terminology. For the daily texts that students in both intervention groups worked on, teachers explained difficult words to the children before they began working on the texts. This was not the case, however, for the standardized tests. It seems plausible that students with MB may have had special deficits in their language skills and breadth of vocabulary (Baumert & Schümer, 2001; Heinze, Herwartz-Emden, & Reiss, 2007) that might have influenced reading comprehension (cf. Ouellette, 2006).

Third, as expected, study participants who worked on text reduction strategies in the context of the seven-step cycle of self-regulated learning (SRL + TEXT) demonstrated an increased preference for self-regulated learning immediately after the training. The study participants in both of the comparison groups (TEXT and REG), on the other hand, showed no such changes. The effect we observed for the combined intervention group (SRL + TEXT) increased again from the posttest to the follow-up measurement 11 weeks after the training.

For the combined intervention condition (SRL + TEXT), the preference for self-regulated learning increased even more for students with MB than for those without. When we compared the MB children in this group to the MB children in the regular instruction group, we observed a preference-rating increase from the first to the second measurement of Cohen's d = 0.50; for the children without MB, the effect only came to Cohen's d = 0.10. Both the MB and non-MB children showed even stronger preferences for self-regulated learning at our follow-up 11 weeks after the training. In comparison to MB children in the regular instruction group, MB children in the combined intervention group showed an increase in the strength of their preference for self-regulated learning from the first to the third measurement of Cohen's d = 0.64; for non-MB children, the same comparison yielded a value of Cohen's d = 0.30.

5.1 General Conclusion

Taken together, we come to the conclusion that these findings add to our understanding of how to increase older elementary students' preference for self-regulated learning and how to help them improve their ability at finding main ideas within an ecologically valid learning setting (De Corte, 2000). A comparison of the combined intervention group (SRL + TEXT) with the text-strategy-only intervention group (TEXT) and with the group receiving regular instruction (REG) shows that practicing text reduction skills within the framework of a normative model of self-regulated learning provides an additional benefit for elementary school children.

The positive development of students in the combined intervention is likely a result of the fact that the intervention adheres to four factors that researchers have identified as being beneficial (e.g., Dignath & Büttner, 2008; Ramdass & Zimmerman, 2011; Schunk & Rice, 1987; Weinstein, Husman, & Dierking, 2000): (a) We introduced the students in the combined intervention condition (SRL + TEXT) to a normative model of self-regulated learning, and they practiced each of the steps described in the model over the course of several weeks with concrete content and concrete strategies; (b) the intervention took place in more than one setting, namely, during regular classroom instruction in basic science and reading and during homework; (c) the intervention included various illustrations of the benefit of self-regulated learning; and (d) over the course of several weeks, students received systematic feedback regarding their learning behavior and the relationship between this behavior and their achievements.

The effect sizes for finding main ideas through the combined intervention are comparable to—and the effect sizes for preference for self-regulated learning are somewhat greater than—those reported for earlier teacher-led interventions (Dignath & Büttner, 2008). The effect sizes for text comprehension are, however, somewhat smaller than in other previous studies (e.g., Paris, Cross, & Lipson, 1984). This difference may reflect the fact that we used standardized tests rather than tests designed specifically for our study. Researcher-designed tests tend to require less transfer of skills from one domain to another (e.g., Kim et al., 2004). Nevertheless, the obtained training effect sizes are lower than those reported for researcher-led training programs in small group settings (e.g., Dignath & Büttner, 2008).

5.2 Limitations and Future Directions

Finally, we mention a number of limitations of our study. A first concern is about the assessment of self-regulated learning. With our assessment of the number of main ideas participants found over the course of the training and with the standardized reading tests, we established objective criteria for assessing achievement. Due to economic constraints, however, self-regulated learning was only assessed with a questionnaire. Thus, we did not measure students' actual behavior but rather their subjective assessments of their own behavior (cf. Artelt, 1999, 2000). In the case of the students in the combined intervention group in particular, this assessment approach can lead to distortions since these students may, by learning about self-regulated learning, be more prone to providing answers that they perceive as being socially desirable. For this reason, students' learning journals should be systematically evaluated in future research (cf. Schmitz, Klug, & Schmidt, 2011). Doing so should offer more insight into self-regulatory behavior during the training phase and provide some indication of the extent to which the self-assessments made in response to the relatively general questions in the questionnaire correspond with the journal entries (e.g., regarding self-monitoring and strategy adaptation) during the intervention. This brings us to a second specific recommendation for future work in this area: As learning-journal entries also reflect subjective assessments of one's own behavior, it would be helpful to also assess students' learning behavior using other approaches such as a microanalytic assessment method (Cleary, 2011), a think-aloud method (Greene, Robertson, & Croker Costa, 2011), or an in-depth case study method (Butler, 2011).

Another limitation is the possible occurrence of a Hawthorne effect, in that teachers changed their teaching behavior because they knew that their classrooms were being studied, not because of the specific intervention they received. However, the occurrence of a Hawthorne effect would have not been confined to the intervention groups because teachers in the REG condition also knew that their classrooms were being studied, such that they could have tried to improve their regular instruction in their own ways, thus making it harder to see intervention effects.

A final concern lies in the fact that we did not explicitly monitor the instruction that the participating teachers carried out during the intervention. Teachers did fill out daily checklists on the materials they used and on the aspects of the intervention which they dealt with, and the results suggest that the interventions fulfill criteria of high treatment integrity. However, we do not have systematic data about how much time teachers spent working on each topic, which methods they preferred (e.g., group work or direct instruction), or how didactically effective their instructional approach was. We also did not collect data on the teachers' attitudes about self-regulated learning or about the intervention. In future research in this area, investigators may be able to incorporate the use of trained observers and/or video recording. In addition, asking teachers about their attitudes toward self-regulated learning, the intervention they are involved in, and its actual execution as well as testing their knowledge of self-regulated learning should provide important information about the conditions under which an intervention can be most effective.

In summary, the results of this study as well as those of other studies offer reason to be optimistic that self-regulated learning can be successfully introduced and practiced during classroom instruction and homework (cf. Ramdass & Zimmerman, 2011; Stoeger & Ziegler, 2011). The transfer of newly acquired self-regulated-learning knowledge and its proceduralization into skills is best facilitated by a combination of various intervention modules that employ various contents (e.g., mathematics, expository texts, vocabulary lists) and strategies (e.g., time management, text strategies, rehearsal strategies) within the framework of a normative model. In the future, researchers will need to (a) examine the efficacy of individual intervention modules, (b) better understand the conditions under which these modules are effective, and (c) look for evidence of both the advantages and the concrete effect of sequentially introducing and practicing the individual modules.

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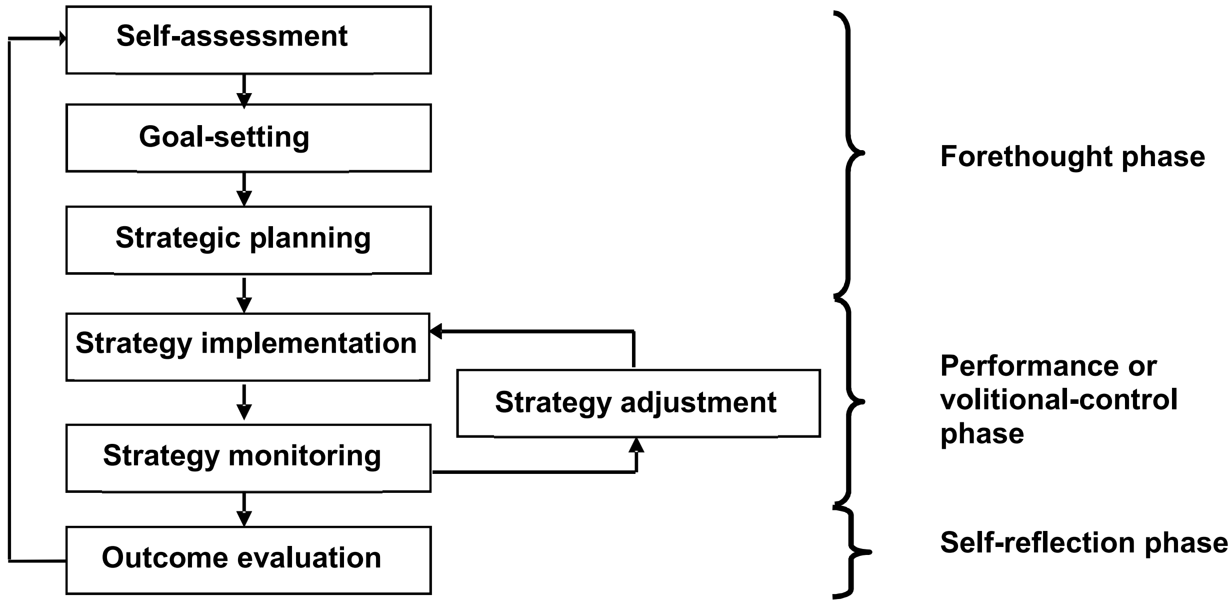

Figure S1. *Seven-step cyclical model by Ziegler & Stoeger (2005) and corresponding phases of Zimmerman's (2000) model*

Online Supplement. *Sample Training Text with Ten Main Ideas Underlined*

Fungi and Mushrooms

Mushrooms are neither plants nor animals. Although they look a lot like plants, they are actually more closely related to animals. When someone mentions mushrooms, perhaps the first you think of is finding edible mushrooms with your parents while on a walk in the forest. Mushrooms are a type of fungus, and fungi can be single-cell or multi-cell organisms. Some fungi are so small that you can only see them through a microscope. Such fungi are single-cell organisms. Baker's yeast is an example of such a fungus. There are also larger fungi, such as the yellow boletus, the button mushroom, and the fly agaric. These larger fungi are multi-cell organisms.

Let's take a closer look at the multi-cell fungi known as mushrooms: When you are in the forest, you will usually find mushrooms that have a stipe and cap. Most people think that the mushroom that they see above the ground is the actual mushroom. But what you see above the ground is just a tiny part of the whole. The parts you see above ground are called the "fruiting body." The actual fungus is the mycelium. It grows underground, so we can't see it. The mycelium consists of a mass of white filaments (tiny little threads) that can keep reproducing new fruiting bodies. Along with the fruiting body and the mycelium, the spores are another important part of multi-cell fungi. This is because most fungi and mushrooms use spores to reproduce. Spores are so tiny that you cannot see them with your naked eye. What you can see without a microscope is spore dust. When a mushroom reproduces, large numbers of new spores grow in the fruiting body. When they have grown, they fall out of the fruiting body. Then the wind picks them up and carries them off. Then new mushrooms begin to grow.

Humans have cultivated mushrooms and other fungi for centuries. Do you know why we grow fungi? For one, we cultivate mushrooms so we can eat them. Of course, we are careful to only cultivate so-called edible mushrooms and not poisonous mushrooms like the fly agaric. Two of the most common edible mushrooms are the button mushroom and the oyster mushroom. Maybe you've had a mushroom soup, a mushroom sauce, or salad with oyster mushrooms.

A second important reason why humans cultivate fungi is that they are important for making medicine. Various fungi have been important for making medicine in China for centuries. People already used fungi in medicine in the 1300s. They used fungi to make them feel better when they had colds, to improve their blood circulation, and to increase their strength. Fungi are still important for making medicine today. The most common modern-day application of fungi in medicine is in making antibiotics. When people have a serious or life-threatening illness, doctors often prescribe antibiotics. As you can see, mushrooms and other fungi are very important for humans.

Mushrooms are also important for our environment. They are known as decomposers. Much as bacteria do, decomposers break down decaying or dead things such as old plants, excrement, or animal carcasses. The decomposers convert these things into substances that are important for the environment. Without the help of decomposers, our world would gradually be overfilled with dead things and waste products.

Table S1. *Overview of Measurement Schedule*

Variable	T1	Intervention	T2	T3
	Summative Evaluation			
Preference for SRL	SRL+TEXT		SRL+TEXT	SRL+TEXT
	TEXT		TEXT	TEXT
	REG		REG	REG
Reading comprehension	*[ELFE]*		*[HAMLET A]*	*[HAMLET B]*
	SRL+TEXT		SRL+TEXT	SRL+TEXT
	TEXT		TEXT	TEXT
	REG		REG	REG
	Process evaluation			
Number of main ideas		SRL+TEXT		
		TEXT		

IV. Artikel 3

Sontag, C., & Stoeger, H. (2015). Can highly intelligent and high-achieving students benefit from training in self-regulated learning in a regular classroom context? *Learning and Individual Differences, 41,* 43–53. doi:10.1016/j.lindif.2015.07.008

Gliederung (Artikel 3)

Can highly intelligent and high-achieving students benefit from training in self-regulated learning in a regular classroom context?

Can Highly Intelligent and High-Achieving Students Benefit from Training in Self-Regulated Learning in a Regular Classroom Context?

Abstract. We examined if highly intelligent and high-achieving students benefit from training in self-regulated learning conducted in regular classrooms as much as their peers of average intelligence and with average scholastic achievement. Fourth-graders participating in a training program of self-regulated learning (SRL, n = 123) were compared with fourth-graders receiving regular classroom instruction (REG, n = 199) in a pretest, posttest, follow-up design. Students in the SRL group practiced self-regulated learning while working on identifying main ideas in expository texts. The training was effective for highly intelligent and high-achieving students as well as for their peers of average intelligence and with average scholastic achievement. Highly intelligent students benefited in their preference for self-regulated learning only in the long run; for high achievers, we found immediate and long-term effects. Both highly intelligent students and high achievers identified more main ideas correctly in the course of the training. We recommend this program for use by classroom teachers in heterogeneous classrooms.

Keywords: self-regulated learning; strategy instruction; highly intelligent students; high-achieving students; intervention study

1. Introduction

Self-regulated learning (SRL) represents a key skill in our rapidly changing society, where lifelong learning has become necessary for everyone (e.g., Council of the European Union, 2002). SRL-skills are therefore important for all students and should be fostered as early as possible. Accordingly, SRL competencies are part of elementary school curricula in several countries (e.g., in Germany: Bayerisches Staatsministerium für Unterricht und Kultus, 2000, 2014) and numerous empirical studies show that SRL can be effectively taught to elementary school students (for an overview cf. Dignath, Buettner, & Langfeldt, 2008). However, few studies exist that explore the effectiveness of SRL interventions in elementary school for students with differing cognitive abilities and achievement levels.

Existing studies on differential effects of SRL training mostly focus on low-achieving elementary school students and students with learning difficulties (e.g., Antoniou & Souvignier, 2007; Graham, Harris, & McKeown, 2013; Rogers & Graham, 2008). However, comparatively little is known about the effectiveness of SRL training for highly intelligent or high-achieving students. In particular, there are – to the best of our knowledge – no studies examining if and how highly intelligent and high-achieving students benefit from SRL training conducted in a regular classroom context. The aim of our study was therefore to test the effectiveness of an SRL training program that was already successfully implemented in regular elementary school classrooms (Stoeger, Sontag, & Ziegler, 2014), for highly intelligent students and for high-achieving students. We will treat highly intelligent students and high-achieving students as two distinct groups with possible overlap: Highly intelligent students may or may not also be high achievers, and high achievers may or may not also be highly intelligent.

1.1 Is it necessary to teach SRL to high-achieving and highly intelligent students?

We understand SRL as an active process, in which students accept responsibility for their own learning by actively setting goals, and by then planning, monitoring, regulating and evaluating their learning progress (cf. Boekaerts, Pintrich, & Zeidner, 2000). Although many current models of SRL comprise cognitive, metacognitive, motivational and emotional aspects of SRL (cf. Boekaerts et al., 2000), we chose to focus on the combination of cognitive and metacognitive strategies, as they seem to be of particular importance for elementary school students (Dignath & Büttner, 2008).

It is often assumed that highly intelligent and high-achieving students know more about learning strategies and self-regulated learning than their peers and that they optimally shape and regulate their learning process without outside help. Sometimes it is also assumed that highly intelligent and high-achieving students do not need learning strategies to succeed in regular classroom settings (cf. Treffinger, 2009). However, research findings only partially confirm these assumptions (for overviews cf. Hoh, 2008; Stoeger & Sontag, 2012; Veenman, 2008).

On average, highly intelligent and high-achieving students do seem to possess more metacognitive knowledge – a prerequisite of SRL – and understand better why strategies are useful (for an overview, cf. Alexander, Carr, & Schwanenflugel, 1995). However, this does not mean that they actually use SRL strategies more often or better than their peers. Sontag, Stoeger, and Harder (2012) showed that highly intelligent students (top 5% in an intelligence test) did not prefer SRL over other forms of learning in regular classroom instruction and that they did not prefer SRL more than their peers in the same classrooms. In a study by Zimmerman and Martinez-Pons (1990), highly intelligent (top 1% in an intelligence test) high achievers from a school for academically gifted students reported using some strategies more often than their peers, but there were no differences in the reported use of other strategies. Bouffard-Bouchard, Parent, and Larivée (1993) studied the actual behavior of highly intelligent students (top 11% in a test of mental ability) and their peers of average intelligence in a learning task and also found that highly intelligent students outperformed their peers only in the use of some strategies, but not in the use of others. Regarding the question if highly intelligent and high-achieving students need to self-regulate their learning to be successful, evidence suggests that in some, relatively unchallenging contexts SRL is in fact not necessary to attain high achievement (Ablard & Lipschultz, 1998; Stoeger, Steinbach, Obergriesser, & Matthes, 2014).

However, although in certain contexts, highly intelligent and high-achieving students do not need to self-regulate their learning to be successful, it is justified to assume that SRL will become necessary in more challenging contexts (e.g., gifted tracks, selective universities) (cf. McCoach & Siegle, 2003; Spörer, 2003). Findings from expertise research (e.g., Zimmerman, 2006) indicate furthermore that SRL is indispensable to achieve excellence in a certain domain. Therefore, SRL training is also relevant for highly intelligent and high-achieving students. In the following section, we will report intervention studies with highly intelligent and high-achieving students.

1.2 Can highly intelligent students and high-achieving students benefit from SRL interventions?

To the best of our knowledge, there are no studies examining if and how both highly intelligent and high-achieving students benefit from SRL training conducted in a regular classroom context. There are studies, however, that – taken together – suggest that both highly intelligent and high-achieving elementary school students could in fact benefit from such interventions as much as their peers. The interventions examined in existing studies fall into three categories: short one-on-one trainings of cognitive strategies; trainings in which cognitive and metacognitive strategies were practiced in small groups; trainings conducted in a regular classroom context with students of above-average intelligence and with underachieving students.

Highly intelligent and high-achieving students seem to benefit from the training of cognitive strategies in one-on-one settings at least as much as their peers. McCauley, Kellas, Dugas, and DeVellis (1976) reported an experiment, in which fifth- and sixth-graders practiced a rehearsal strategy in two one-on-one sessions scheduled in the same week. Both students of above-average intelligence (IQ ≥ 115) and students of average intelligence (IQ ≤ 95) benefited from the practice sessions, with students of above-average intelligence benefiting slightly more ($p < 07$). Scruggs and Mastropieri (1988) trained high-achieving fifth- and sixth-graders (SAT math or reading percentile rank ≥ 94) and their peers with average scholastic achievement (with average SAT math scores corresponding to the 59th percentile, and average SAT reading scores corresponding to the 55th percentile) in the use of a rehearsal strategy during one one-on-one session. They found that both high achievers and students with average scholastic achievement benefited from the training, with a greater training benefit for the high-achieving students.

Highly intelligent and high-achieving students can also benefit from SRL training conducted in small-group settings. Schunk and Swartz (1993b) conducted a program with gifted fourth-graders that had been proven effective for regular fourth-grade students (Schunk and Swartz, 1993a). Participants were students from two gifted classrooms (PR ≥ 98 in a score combining the results of a cognitive ability test and a reading test) who were randomly assigned to one of three experimental conditions. All students received 20 sessions of 45 min of cognitive writing strategy instruction in small groups delivered by teachers from outside the school. One group of students was instructed to monitor their strategy use and received feedback on their writing strategy use (SRL condition); the second group was instructed to monitor their strategy use but did not receive strategy feedback (partial SRL condition), and the third group of students was not instructed to monitor their strategy use and did not receive strategy feedback (cognitive strategy condition). Students in the SRL condition outperformed students in the other two conditions in writing achievement, writing strategy and motivational variables. Fischer (2008) reported two interventions in which gifted students practiced SRL in small groups. The first program was a three-day extracurricular intensive course designed according to the needs of gifted students with learning difficulties of grades three through nine. Pre-test–post-test comparisons showed improvements in strategy knowledge and in scholastic performance for participating students (intelligence test scores: $M = 132.48$, $SD = 9.33$); results for a control group were not reported. In the second program, gifted students (intelligence test scores: $M = 123.59$, $SD = 1.87$) in grades three to six were pulled out for one ninety-minute block of regular school instruction per week over the course of an entire school year in order to participate, in small groups, in a program promoting SRL. In comparison with their non-gifted peers who stayed in regular instruction and did not participate in the program, the gifted students showed greater improvements in their strategy knowledge, their learning behavior and their scholastic performance. A comparison with a control group of gifted students who did not receive the intervention was not reported.

To our knowledge, there are only two studies on SRL training conducted in regular classroom contexts, in which effects for students with above-average intelligence (Stoeger & Ziegler, 2010) and highly intelligent underachievers (Stoeger & Ziegler, 2005) were reported. In both studies, the SRL training was integrated into fourth-grade mathematics instruction at regular elementary schools and led by the students' regular classroom teachers who had received extensive training before implementing the program. All students in the participating classrooms received seven weeks of daily SRL and math training, while students in control classrooms received regular mathematics instruction. To examine the possibility that the training program had differential effects on students of different cognitive abilities, Stoeger and Ziegler (2010) divided the participating students into four subgroups (quartiles) on the basis of their intelligence test scores; thus, with the top 25% most intelligent students in this group, the group of students with above-average intelligence was relatively broad. The authors concluded that – in comparison to a control group – students benefited from the program irrespective of their cognitive ability level in terms of homework behavior, motivational variables and math performance. Stoeger and Ziegler (2005) showed furthermore that gifted underachievers (defined as students with an intelligence test score of at least 130 and z-standardized math grades one standard deviation below their z-standardized intelligence test score) who were trained in regular classrooms benefited from the training program compared to a control group of gifted underachiever who received regular classroom instruction.

Summing up, existing studies suggest that highly intelligent and high-achieving elementary school students can benefit from SRL programs as much as their peers. However, we only know of one study in which the effects of SRL training conducted in a regular classroom context were analyzed for students with above-average intelligence (Stoeger & Ziegler, 2005). In this study, the defining criterion of above-average intelligence was relatively broad, and effects for high-achieving students were not analyzed separately.

1.3 Current study

Due to the lack of sufficient empirical evidence, we designed a study to examine whether both highly intelligent and high-achieving elementary school students can benefit as much as their peers from an SRL intervention conducted during regular classroom instruction. For our study, we chose an SRL training program that we deemed suitable for highly intelligent and high-achieving students as well as for their peers of average intelligence and their peers with average scholastic achievement. We deemed a program suitable for our purpose, if it offered all students the opportunity to experience the benefits of SRL. To ensure that all students experience the benefits of SRL, they have to realize that improving their cognitive and metacognitive strategy use results in higher achievement. This realization could be achieved, for example, by providing students with feedback that draws attention to the connection between strategy use and achievement (cf. Dignath & Büttner, 2008; Hattie & Timperley, 2007). Thereby, it is of particular importance that highly intelligent and high-achieving students also have the opportunity to improve their achievement with the help of enhanced learning behavior. To this end, the training must include tasks that are sufficiently challenging for these students.

For our study, we chose to work with the SRL training by Stoeger and Ziegler (2008) that uses tasks of an adequate difficulty level and incorporates systematic feedback about connections between learning behavior and achievement. The general effectiveness of this training for fourth-grade elementary students has already been shown (Stoeger, Sontag, et al., 2014). In this seven-week program, students are introduced to both cognitive and metacognitive strategies and are given ample opportunity to practice them while working on short scientific texts. The program consists of two information weeks and five SRL practice weeks and is designed for use in basic science and reading instruction in regular classrooms. In the information weeks, students are introduced to three cognitive text reduction strategies (underlining and copying main ideas verbatim, drawing a mind map containing main ideas, and summarizing main ideas in one's own words) and to a normative model of SRL (cf. Ziegler & Stoeger, 2005) consisting of seven steps (self-assessment, goal setting, strategic planning, strategy implementation, strategy monitoring, strategy adjustment and outcome evaluation). In the five SRL practice weeks, the students practice all of these strategies by applying them to the recurring training task: The students read one short scientific text of comparable difficulty each day (25 altogether) and are asked to identify the ten main ideas included in each text. The tasks in this program were designed with heterogeneous classrooms in mind: manageable for all students and sufficiently complex and challenging for highly intelligent and high-achieving students. The texts have a value of 69.16 (*SD* = 3.73) in the German version of the Flesh readability index, a value typically found in fifth-grade texts (cf. Amstad, 1978). Therefore, the text difficulty itself should be challenging for fourth-grade students. Weaker students are advised to aim at identifying a small number of main ideas in the beginning but to increase this number after a while; stronger students are advised to aim at identifying up to ten main ideas over the course of the five weeks. In this way, all students can have achievement gains.

Based on existing research and on the program's characteristics, we assume that highly intelligent students and high-achieving students as well as their classmates of average intelligence and their classmates with average scholastic achievement benefit equally from the intervention. Compared to a control group with regular classroom instruction we expect similarly positive training effects on the preference for SRL for students in all intelligence-based and achievement-based subgroups. We also expect that students in the training group will improve their achievement in the training task of identifying main ideas in the course of the training, irrespective of their intelligence or achievement level.

2. Method

2.1 Participants and design

In this study, we analyzed a subsample (*N* = 322) from a larger evaluation study conducted in Germany in which we had found effects of students' migration status. To enable a focus on the training effects for highly intelligent and high-achieving students in the current study and in order to keep the manuscript readable, we decided to restrict our sample to students without migration background. For this reason, all students and their parents in this sample had been born in Germany. Particularly, we compared 123 fourth-grade students (67 boys, 56 girls) who participated in the abovementioned training of self-regulated learning (SRL) with 199 fourth-graders (107 boys, 92 girls) who received regular classroom instruction (REG). The students in our sample were on average 9.78 years old (*SD* = 0.39). The gender distribution within the sample was even (45.96% girls). Teachers' and students' participation in the evaluation study was voluntary and all participants consented to participation.

In our study, we examined if an SRL-training had differential effects on highly intelligent and high-achieving students and their peers of average intelligence and their peers with average scholastic achievement. We used a pre-test–post-test follow-up control-group design to examine potential differences in the effect on the preference for self-regulated learning both immediately after the training and 11 weeks later. We also examined potential differences in the training task of identifying main ideas in scientific texts. For this, we analyzed the achievement gains in the course of the five SRL practice weeks (PW 1–5). We compared the results of highly intelligent students and high-achieving students who participated in the SRL intervention with the results of their peers of average intelligence and their peers with average scholastic achievement. Table 1 shows the design of our study. We explain the independent variables (treatment conditions; subgroups based on intelligence and on achievement) and the dependent variables (preference for self-regulated learning, number of correctly identified main ideas) in more detail in Sections 2.2 and 2.3.

Table 1. *Study Design*

Treatment	Subgroup	T1 (pre-test)	Intervention							T2 (post-test)	T3 (follow-up)
			Info 1	Info 2	PW 1	PW 2	PW 3	PW 4	PW 5		
SRL condition	Top 10% intelligent Bottom 90% intelligent Top 10% grades Bottom 90% grades	Preference for SRL	-	-	Number of main ideas	Number of main ideas	Number of main ideas	Number of main ideas	Number of main ideas	Preference for SRL	Preference for SRL
REG condition	Top 10% intelligent Bottom 90% intelligent Top 10% grades Bottom 90% grades	Preference for SRL	-	-	-	-	-	-	-	Preference for SRL	Preference for SRL

Note. SRL = self-regulated learning; REG = regular classroom instruction; Info = informational week; PW = practice week.

2.2 Independent variables

2.2.1 Treatment conditions. In the current study, we compared two treatment conditions: students who received a training program of self-regulated learning in which the abovementioned text reduction and metacognitive learning strategies were taught (SRL) and students who received regular classroom instruction (REG). Students in both treatment conditions received instruction during regular classroom hours and in their regular classroom contexts. As the students in the training condition read texts about topics from the natural sciences, the training was conducted mainly during reading instruction and instruction in basic science. Instruction in both conditions was delivered by the students' regular classroom teachers. Classroom teachers in the SRL condition attended a 2-day workshop before administering the training program in their classrooms. On the first day of the workshop the theoretical background of the training program was conveyed. On the second day the training material and its use during the training was discussed. Teachers received training manuals for the students that included the 25 basic science texts, learning diaries and various other training materials. They also received teacher manuals documenting the material covered in the workshop, checklists for each day of the training program as well as sample solutions for the reading tasks. Teachers in the SRL condition were supervised throughout the program (cf. Section 2.4.1).

2.2.1.1 Training in self-regulated learning (SRL). Students in the SRL condition received a training program in which they completed daily classroom activities and homework assignments to practice the seven steps of the cycle of self-regulated learning, a normative model by Ziegler and Stoeger (2005). This cycle encompasses self-assessment, goal setting, strategic planning, strategy implementation, strategy monitoring, strategy adjustment and outcome evaluation. Within this cycle students particularly learned to use, monitor and adjust three different text reduction strategies (underlining, mind mapping, summarizing) when working on the training task of identifying main ideas in basic science texts. The training program consisted of 2 informational weeks and, thereafter, 5 SRL practice weeks, with daily sessions lasting between 40 and 60 min.

During the first informational week, students learned why it is important to understand texts, what main ideas are, how they can identify them in expository texts, and how they can differentiate between main ideas and less important passages in a text. Teachers also presented and modeled three reduction strategies that are useful for identifying and displaying main ideas: (a) underlining and copying main ideas verbatim, (b) drawing a mind map containing main ideas, and (c) summarizing main ideas in one's own words. Students were given the opportunity to practice each text reduction strategy on a short expository text (approximately 200–240 words).

During the second informational week, teachers introduced the self-regulated learning cycle by Ziegler and Stoeger (2005). Teachers thoroughly discussed each phase of self-regulated learning with their students. To do this they used various examples drawn from everyday situations such as completing homework or practicing a certain sports skill. A poster of the learning cycle, provided in the training materials, was meant to ensure that students would have frequent and easy access to visualizations of the learning cycle and its individual phases while working through the training program. At the end of the second informational week, teachers provided their students with information on effective goal-setting and discussed common goal-setting mistakes with their students. As one goal of the intervention was to make students aware of the relationship between using learning strategies and achieving learning goals and as this is a very demanding task for fourth-graders, students learned to set relatively simple quantitative outcome goals (e.g. “My goal is to find 7 main ideas."). At the end of the second informational week, teachers informed their students about the structure of the training program in the upcoming weeks.

During the following weeks, the SRL practice weeks, students repeatedly and consciously worked through all phases of the learning cycle. Every school day, students were to read an expository text about a topic from the natural sciences (e.g., fungi and mushrooms; rainbows; desert plants; blood) and then to identify the ten main ideas. As described in Section 1.3, these texts were especially written for this training program with the aim to support all students in their efforts to improve strategy use and SRL.

During the SRL practice weeks, students kept a structured learning journal that accompanied them as they progressed through the learning cycle. At the beginning of each SRL practice week, students set a specific outcome goal for themselves that specified how many main ideas (ten being the maximum) per daily text they aimed to find. The students were encouraged to set goals for themselves that were challenging but achievable. They noted their goals in their learning journal, and they also wrote down what strategy they planned to use in order to achieve their goal. During SRL practice Weeks 1–3, one of the three previously introduced text reduction strategies for identifying and displaying main ideas was prescribed by the program per week: underlining and copying verbatim for the first SRL practice week, mind mapping for the second, and summarizing for the third. This way, all students had the opportunity to practice each strategy systematically. In the remaining two SRL practice weeks, students chose text reduction strategies that they felt had been particularly helpful during the previous weeks and/or text reduction strategies for which they felt they could profit from continued practice of their effective implementation.

During classroom instruction they read the daily text silently and then had the opportunity to ask their peers and teacher about unknown words. Then, before taking the text home and working further with it as homework assignment, they noted in their learning journal how many of the ten main ideas they thought they would find in that text (self-assessment). At home, they used that week's text reduction strategy to identify and display the main ideas in the text. Right after having finished this part of their homework assignment, they evaluated how well their strategy worked on that day and wrote it down in their learning journal. They also wrote down how they wanted to improve their strategy use the next day. The next day, the homework assignment was corrected and discussed in class. Teachers based this discussion on the sample solutions they had received as part of the teachers' manual. The students noted in their learning journal how many of the main ideas they actually found and compared this number with their self-assessments. In a teacher–class dialogue, the teacher addressed the connection between strategy use and outcome. Students were encouraged to use their experience with the text from the previous day to improve their self-assessment and strategy use when working on the next text.

Each Friday, Thursday's homework assignment was discussed first. Then, the students worked on a new text during classroom instruction. After discussing results and strategy use for this new text, the teacher initiated a discussion about learning behavior, strategy use, and results in the current week. Appropriate prompts were integrated into the students' learning journals to help facilitate this reflection process. The students thus also took time during classroom instruction on Fridays to summarize and reflect upon the current week in their journals. By answering various questions, students learned how to use their experience from this week to improve their learning behavior in the following week.

2.2.1.2 Regular classroom instruction (REG). Students in the REG condition received regular classroom instruction in reading and basic science according to the current curriculum. The curriculum explicitly lists the use of text reduction strategies such as underlining, making graphic representations, and summarizing as part of the reading instruction and summarizing basic scientific texts as part of the basic science instruction. In addition, the curriculum explicitly encourages teachers to emphasize self-regulated learning as the basis for lifelong learning and to transfer more and more responsibility for the learning process onto the students (Bayerisches Staatsministerium für Unterricht und Kultus, 2000, 2014). Students in this condition spent between 20 and 30 min on their reading and basic science homework assignments each day. All in all, it can be assumed that the content covered in the REG condition is similar to the content covered in the SRL condition.

2.2.2 Subgroups by intelligence and scholastic achievement. We classified students as highly intelligent when their intelligence test score was in the top 10% of the sample (cf. Gagné, 2004). We classified students as high-achieving when their grades were in the top 10% of the sample (cf. Ee, Moore & Atputhasamy, 2003).

2.2.2.1 Measuring intelligence. We used the German version of Raven's Standard Progressive Matrices (SPM) (Horn, 2009) as a measure of general intelligence. This non-verbal multiple-choice test consists of 60 tasks in which students are asked to select a single item that completes a given pattern of six or eight items. In this study, we selected students scoring at or above the 91st percentile within our sample as “highly intelligent” students. The remaining students are referred to as “students of average intelligence”. The SPM's internal consistency came to $\alpha = .90$ in our sample.

2.2.2.2 Measuring scholastic achievement. Teachers provided us with their students' report-card grades of the previous school year. As a measure of scholastic achievement, we calculated the average grade for the three main subjects (language arts, math, and basic science). The German grading scale ranges from 1 (very good) to 6 (insufficient). In this study, we refer to students scoring at or above the 91st percentile within out sample as “high achievers”, and to all other students as “students with average scholastic achievement”.

2.2.2.3 Intelligence and scholastic achievement in the subgroups. Table 2 shows the students' intelligence test scores and grades by treatment conditions and by subgroups based on intelligence and achievement. In both treatment conditions, highly intelligent student have better grades than their peers of average intelligence, and high-achieving students are more intelligent than their peers with average scholastic achievement ($p < .05$ in all t-tests). Still, a cross tabulation showed that the top 10% most intelligent students and the top 10% high-achieving students are two almost distinct groups: Only 5 students are in both groups, 24 students are only in the highly-intelligent group and 15 students are only in the high-achieving group.[1] The five students that were both highly intelligent and high-achieving were included in both groups for later analyses.

[1] The Top-10% are not exactly 10% of the sample, because the grouping is based on percentile ranks (91st or higher for the respective Top-10%-group.)

Table 2. *Mean Values for Intelligence and Achievement per Treatment Condition and Intelligence- and Achievement-Based Subgroup*

				SRL		REG	
Variable	Subgroup	*n* (SRL)	*n* (REG)	*M*	*SD*	*M*	*SD*
SPM test scores	All students	123	199	39.88	7.22	37.99	7.40
	Top 10% intelligent	13[b]	16[b]	50.13	2.20	50.89	2.22
	Top 10% grades	11[b]	9[b]	44.09	4.04	43.37	6.06
	Bottom 90% intelligent	110[b]	183[b]	38.69	6.63	36.90	6.61
	Bottom 90% grades	112[b]	190[b]	39.47	7.34	37.74	7.38
Grades[a]	All students	123	199	2.62	0.89	2.48	0.67
	Top 10% intelligent	13[b]	16[b]	1.96	0.71	1.95	0.42
	Top 10% grades	11[b]	9[b]	1.18	0.17	1.30	0.11
	Bottom 90% intelligent	110[b]	183[b]	2.69	0.88	2.53	0.67
	Bottom 90% grades	112[b]	190[b]	2.76	0.80	2.54	0.64

Note. SRL = self-regulated learning; REG = regular instruction.
[a] Grades are scaled inversely with 1 = very good and 6 = insufficient; [b] The Top-10%- and Bottom-90%-groups are not exactly 10% or 90% of the sample, because the grouping is based on percentile ranks (91st or higher for the Top-10%-group).

2.3 Dependent measures

2.3.1 Preference for SRL. Preference for SRL was measured with the 28 items of the “Fragebogen Selbstreguliertes Lernen-7, or FSL-7” [Questionnaire of Self-regulated Learning-7] by Ziegler, Stoeger and Grassinger (2010). The FSL-7 is based on Ziegler and Stoeger's (2005) seven-step cyclical model of self-regulated learning. Four school-relevant situations are described briefly: studying for school, preparing for the upcoming school year during the summer holidays, preparing for an in-class test, and catching up on school work after an illness. In each situation, the students are asked to indicate their preferred method of learning for each of the seven steps of self-regulated learning (self-assessment, goal-setting, strategic planning, strategy implementation, strategy monitoring, strategy adjustment, and outcome evaluation) by choosing one of three alternatives: self-regulated, externally regulated, or impulsive learning. The following is a sample item (Situation 1, Step 2: Goal-setting): How do you study for school? a) I set a goal for myself describing what and how much I want to study [self-regulated learning], b) My teacher or parents should tell me which goal I should set for myself [externally regulated learning], c) When studying, I don't set a specific goal for myself. I can rely on my intuition [impulsive learning]. In the present study, a research assistant or the classroom teacher read the four situations and the response alternatives out loud, ensuring that everyone, including weak readers, could complete the questionnaire in adequate time.

As we were only interested in the overall preference for SRL in this study, we calculated the SRL score by counting the frequency with which a student chose self-regulated learning and dividing it by the number of items answered. For ease of understanding, the scores are reported as percentages. For example, a student who chose the self-regulated learning option in 13 out of the

28 items would be given a score of 46.43%. The internal consistency came to .83 at T1 (Time 1/pretest), .90 at T2 (Time 2/posttest) and .94 at T3 (Time 3/follow-up test).

2.3.2 Main ideas. For students in the SRL condition, we used the weekly average of correctly identified main ideas in the SRL practice weeks (see Section 2.2.1.1 for details) as a measure of achievement. We collected all of the students' training materials after the end of the training program. Using a list of the correct main ideas for each text as a reference, trained research assistants counted the number of correctly identified main ideas in each text (range 0–10 main ideas). After completing this rating process, we returned the training materials to the students. As students had completed five SRL practice weeks with five texts each week, we obtained five achievement values (average number of main ideas per week) per student.

2.4 Procedure

2.4.1 Implementing the treatment conditions. We obtained permission to conduct this study from the local school authorities who also assisted in recruiting participating classrooms by notifying all fourth-grade teachers about our study. Teachers in both conditions signed up for participation in an evaluation study of a classroom-based text-strategy program as part of their professional development requirements. We then assigned teachers to the intervention or the regular instruction condition (under the pretense that we had a maximum number of participants and raffled off the spots). Teachers in the intervention condition completed a 2-day workshop before delivering the treatment, and we supervised them carefully throughout the program. We provided all teachers with the authors' phone number and e-mail address, so they could contact them with any questions regarding the implementation of the training program or the evaluation. In addition, we met with all teachers of the intervention condition four weeks into the training program, discussing practical issues of administering the program and answering questions. Teachers were encouraged to continue contacting the authors if they had questions during the remaining weeks of the training program. In addition, teachers were encouraged to contact their colleagues from the same condition to discuss the implementation of the program.

Teachers delivered the treatment in 7 consecutive weeks during regular classroom hours in reading instruction and basic science. A checklist containing all training materials and activities helped teachers to implement the daily lessons as intended. Teachers in the regular instruction condition continued “business as usual”. They were offered the training materials after the study ended and were promised preferential admission to future workshops. We debriefed all teachers at the end of our study.

2.4.2 Obtaining evaluation measures. At T1, students filled out the questionnaire on their preference for self-regulated learning during one 35-min session, questions on demographic information in another session that lasted 15 min, and completed the SPM intelligence test in a third session that lasted 50 min. The three sessions were scheduled for different days to minimize fatigue. At T2 and T3, the students completed the FSL-7. They had 35 min each time. The testing sessions were scheduled during regular classroom hours in the week before the training started (T1), in the week after it concluded (T2), and another 11 weeks later (T3). The sessions were led by the classroom teachers or trained research assistants. Classroom teachers in the intervention condition received information on conducting the evaluation as part of their workshop, teachers in the regular instruction condition and research assistants received this information in a separate session. To ensure comparable testing conditions, all persons conducting the evaluation followed a detailed manual and read out instructions verbatim. The instrument measuring achievement in the training task was included in the training materials in the SRL group and scored by research assistants as described in Section 2.3.2.

2.5 Sample drop-out and missing data

For preference for SRL, the following data are missing: three students (0.9%) missed the questionnaire on SRL at T1, five students (1.6%) at T2, and 13 students (4.0%) at T3. To handle missing data appropriately, we used the multiple imputation method implemented in SPSS 20 to generate five imputed datasets (cf. Graham, 2009; Schafer & Graham, 2002). We analyzed these five datasets simultaneously in SPSS and pooled all parameter estimates.

We received training materials from 121 of the 123 students in the SRL group to analyze achievement gains in the training task. Seventy-nine students (65.3%) completed all texts, 18 students (14.9%) missed only one text, nine students (7.4%) missed two texts, six students (5%) three texts, and nine students (7.4%) between four and thirteen texts. As with the SRL measure, we analyzed five imputed datasets simultaneously in SPSS and pooled parameter estimates.

3. Results

Our preliminary analyses comprise descriptive statistics and correlations for all variables as well as analyses of potential differences in the dependent variables at baseline. The differential training evaluation consists of analyses regarding the training effect on the preference for SRL and of analyses regarding the achievement gain in the course of the training.

3.1 Preliminary analyses

Table 3 contains descriptive statistics and correlations for all variables used in the evaluation. Descriptive statistics are presented for the whole sample (for descriptive statistics by treatment condition and intelligence- and achievement-based subgroup, see Tables 4 and 6); descriptive statistics for and correlations with the number of correctly identified main ideas are available only for the SRL group.

Students chose SRL as their preferred approach to learning for slightly more than one third of all FSL-7 items before the start of the program and slightly more later in the school year. The rather large standard deviation indicates large differences between students. Students in the SRL group correctly identified slightly over six main ideas (out of 10) in the first practice week of the program and, on average, improved their performance to over seven main ideas in the last practice week. Intelligence scores are comparable to scores in the German norm sample (cf. Horn, 2009), and grades are as expected.

Correlations are presented for the two treatment conditions separately. In both conditions, the SRL measures at different points in time were strongly correlated. Intelligence test scores and grades correlated as expected; however, neither correlated with preference for SRL. The number of correctly identified main idea per practice week was collected only for students in the SRL condition. The measures in the different practice weeks were strongly correlated. The number of correctly identified main ideas was not correlated with preference for SRL, with the (unexpected) exception of preference for SRL at T1 and number of correctly identified main ideas in PW 2. The number of correctly identified main ideas correlated with non-verbal intelligence and with grades as expected.

Table 3. *Descriptive Statistics and Bivariate Pearson Correlations*

		Scale	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1	Preference for SRL (T1)	0;100	33.88	19.98	-	.59**	.45**	-	-	-	-	-	-.05	-.04
2	Preference for SRL (T2)	0;100	37.05	25.23	.61**	-	.67*	-	-	-	-	-	.11	-.04
3	Preference for SRL (T3)	0;100	38.79	29.32	.52**	.72**	-	-	-	-	-	-	.02	.02
4	Main ideas (PW 1)	0;10	6.13	1.77	.13	.04	.09	-	-	-	-	-	-	-
5	Main ideas (PW 2)	0;10	6.10	1.76	.25**	.13	.15	.70**	-	-	-	-	-	-
6	Main ideas (PW 3)	0;10	6.79	2.07	.15	.05	.04	.67**	.74**	-	-	-	-	-
7	Main ideas (PW 4)	0;10	6.78	1.97	.13	.00	.03	.67**	.71**	.79**	-	-	-	-
8	Main ideas (PW 5)	0;10	7.33	1.72	.13	.01	.00	.54**	.63**	.70**	.72**	-	-	-
9	Intelligence (T1, SPM)	0;60	38.71	7.38	.04	-.04	.05	.25**	.31**	.28**	.33**	.32**	-	-.31**
10	Grades[a]	1;6	2.53	0.77	-.12	-.06	-.13	-.50**	-.55**	-.61**	-.47**	-.54**	-.54**	-

Note. Correlations in the SRL group (*n* = 123; n = 121 for main ideas per week) are presented below the diagonal line, correlations in the REG Group (*n* = 199) are presented above the diagonal line. SRL = self-regulated learning; PW = SRL practice week; SPM = Standard Progressive Matrices Test.

[a] Grades are scaled inversely with 1 = very good and 6 = insufficient.

**p* < .05, two-tailed; ***p* < .01, two-tailed.

At T1 (before the training), students in the SRL and the REG group did not differ in their preference for SRL (p = .32). Differential analyses showed, however, that high-achieving students in the SRL condition preferred SRL more than high-achieving students in the REG condition (p = .03), and that students of average intelligence in the SRL condition preferred SRL more than students of average intelligence in the REG condition (p = .03). There were no differences between treatment conditions for highly intelligent students and students with average scholastic achievement (p = .90 and .19, respectively) (for descriptives, cf. Table 4). Within the SRL condition, highly intelligent students did not prefer SRL more than their peers of average intelligence (p = .78), but high-achieving students preferred SRL more than their peers with average scholastic achievement (p < .01). Within the REG condition, highly intelligent students and high achievers did not differ from their respective peers in their preference for SRL (p = .86 and .99 respectively). In the first practice week of the program, highly intelligent students correctly identified more main ideas than their peers of average intelligence (p < .01), and high achievers correctly identified more main ideas than their peers with average scholastic achievement (p < .01) (for descriptives, cf. Table 6).

3.2 Differential training effects

3.2.1 Effects on preference for self-regulated learning. Descriptive statistics for the preference for SRL in the different subgroups at the different data-collection points are shown in Table 4. Before testing for differential training effects, we conducted ANOVAs to examine the training's general effectiveness for the whole sample and the four different subgroups, running five separate 3 × 2 (Time points x Treatment condition) repeated measurement ANOVAs and examining the interaction between Time points and Treatment condition. Mauchly's test indicated that the assumption of sphericity had been violated in the analyses of the whole sample ($X^2(2) = 27.86$, $p < .01$), in the subsample of students of average intelligence ($X^2(2) = 26.63$, $p < .01$), and in the subsample of students with average scholastic achievement ($X^2(2) = 30.43$, $p < .01$). Following a recommendation by Girden (1992; see also Field, 2009) for sphericity estimates greater than .75, we used the Huynh–Feldt correction of degrees of freedom in these analyses (ε = .93, .92, and .92, respectively). We found interaction effects in all groups, showing the training's effectiveness for the total sample ($F(1.86, 595.11) = 8.19$, $p < .01$, partial $\eta^2 = .02$) and for all four subgroups (Top 10% intelligent: $F(2, 53) = 4.37$, $p = .04$, partial $\eta^2 = .12$; bottom 90% intelligent: $F(1.86, 541.35) = 6.28$, $p < .01$, partial $\eta^2 = .02$; top 10% grades: $F(2, 36) = 3.68$, $p = .04$, partial $\eta^2 = .17$; bottom 90% grades: $F(1.86, 552.07) = 6.65$, $p < .01$, partial $\eta^2 = .02$). As shown in Fig. 1, preference for SRL increased in all four intelligence- or achievement-based subgroups for students in the SRL condition (solid lines), whereas for students in the REG condition (broken lines), preference for SRL increased and then decreased for highly intelligent students, decreased for high achievers, and remained constant for students of average intelligence and for students with average scholastic achievement.

Table 4. *Descriptive Statistics for Preference for SRL per Treatment Condition and Intelligence- and Achievement-Based Subgroup.*

			T1				T2				T3			
			SRL		REG		SRL		REG		SRL		REG	
Sub-group	*n* (SRL)	*n* (REG)	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
All	123	199	36.92	20.80	32.00	19.27	42.98	25.99	33.57	24.17	48.24	30.48	32.95	27.04
I-10	13[a]	16[a]	35.15	25.25	33.94	24.50	42.50	29.17	44.12	25.48	53.90	30.85	36.61	31.87
G-10	11[a]	9[a]	56.17	22.98	32.08	26.77	59.81	29.43	20.70	25.36	66.56	33.63	16.67	18.30
I-90	110[a]	183[a]	37.11	20.31	31.84	18.84	42.68	25.69	32.67	23.91	47.57	30.47	32.65	26.67
G-90	112[a]	190[a]	35.03	16.69	32.00	18.94	41.00	25.15	34.18	24.01	46.44	29.71	33.73	27.18

Note. SRL = Preference for self-regulated learning; I-10 = Top 10% intelligent, G-10 = Top 10% grades, I-90 = Bottom 90% intelligent, G-90 = Bottom 90% grades.

[a] The Top-10%- and Bottom-90%-groups are not exactly 10% or 90% of the sample, because the grouping is based on percentile ranks (91[st] or higher for the Top-10%-group).

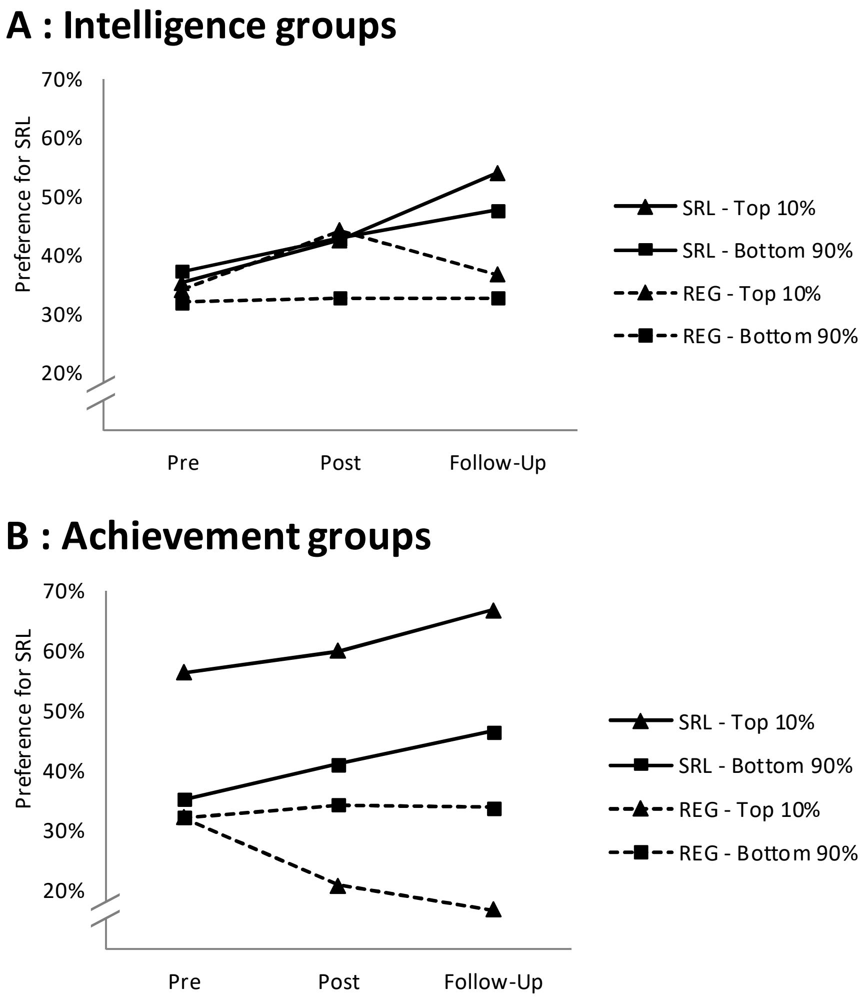

Figure 1. *Preference for SRL by treatment condition and time. Panel A: Highly intelligent students vs. students of average intelligence. Panel B: High-achieving students vs. students with average achievement. SRL: Students in this group trained self-regulated learning and text reduction strategies, REG: Students in this group received regular classroom instruction*

As the effect size partial η^2 cannot be compared across studies (e.g., Bortz & Döring, 2006), we additionally report the effect size *d*. In particular, we report the effect gain in the preference for SRL, that is post-test effects and follow-up-test effects adjusted for pre-test effects for all subgroups (cf. Table 5). Positive values indicate an advantage for the intervention group. At post-test, we found a small negative effect on preference for SRL for highly intelligent students, small positive effects for the total sample, for the students of average intelligence, and for students with average scholastic achievement, and a medium effect for high achievers. The effects on preference for SRL were greater at the follow-up test: We found small-to-medium effects for the total sample, the students of average intelligence, and students with average scholastic achievement, a medium effect for highly intelligent students and a large effect for high achievers.

Table 5. *Effect Sizes for Preference for SRL per Treatment Condition and Intelligence- and Achievement-Based Subgroup*

Dependent variable	Subgroup	*n* (SRL)	*n* (REG)	Post-test effect size adjusted for pre-test effect size[b, c]	Follow-up effect size adjusted for pre-test effect size[b, d]
Preference for SRL	All students	123	199	0.13	0.29
	Top 10% intelligent	13[a]	16[a]	-0.11	0.50
	Top 10% grades	11[a]	9[a]	0.44	0.82
	Bottom 90% intelligent	110[a]	183[a]	0.14	0.26
	Bottom 90% grades	112[a]	190[a]	0.11	0.28

Note. SRL = self-regulated learning.
[a] The Top-10%- and Bottom-90%-groups are not exactly 10% or 90% of the sample, because the grouping is based on percentile ranks (91st or higher for the Top-10%-group); [b] Effect size was computed as $d = (M_A\text{-}M_B)/SD_{AB}$ with $SD_{AB} = \sqrt{[(n_A-1)*SD_A^2+(n_B-1)*SD_B^2]/[((n_A-1)+(n_B-1)]}$ (cf. Bortz & Döring, 2006, pp. 606-607, formula 9.1 and 9.4, recommended to compare samples of different sizes). Positive values indicate an advantage for the treatment condition. [c] Adjusted effect size was calculated as post-test effect size minus pre-test effect size. [d] Adjusted effect size was calculated as follow-up effect size minus pre-test effect size.

To formally test for differential training effects on the preference for SRL, we conducted two 3 x 2 x 2 (Time x Treatment condition x Subgroup) repeated measurement ANOVAs, with subgroups operationalized via intelligence in the first analysis and via achievement in the second analysis. As Mauchly's test indicated that the assumption of sphericity had been violated in both analyses ($X^2(2) = 28.86$, $p < .01$, and $X^2(2) = 27.43$, $p < .01$), we used the Huynh–Feldt correction to adjust the degrees of freedom in these analyses ($\varepsilon = .93$ and .94). The significance of the three-way-interaction Time x Treatment condition x Subgroup would indicate differential training effects. We did not observe such differential effects, neither with intelligence-based subgroups nor with achievement-based subgroups ($F(1.87, 593.89) = 1.28$, $p = .28$, partial $\eta^2 = .00$; and $F(1.87, 596.17) = 1.28$, $p < .28$, partial $\eta^2 = .00$).

3.2.2 Achievement gains in the identification of main ideas. Table 6 shows the mean number of correctly identified main ideas in each training week (*SD*) for all students in the SRL training group, and separately for highly intelligent students, high achievers, students of average intelligence, and students with average scholastic achievement. Five separate repeated measurement ANOVAS showed an increase in the number of correctly found main ideas in the course of the training both in the whole training group ($F(4, 480) = 29.53$, $p < .01$, partial $\eta^2 = .20$), and in all four subgroups (Top 10% intelligent: $F(4, 46) = 4.09$, $p < .01$, partial $\eta^2 = .26$; bottom 90% intelligent: $F(4, 430) = 26.10$, $p < .01$, partial $\eta^2 = .20$; top 10% grades: $F(4, 40) = 4.09$, $p < .01$, partial $\eta^2 = .31$; bottom 90% grades: $F(4, 436) = 26.87$, $p < .01$, partial $\eta^2 = .20$). In order to examine potential differential effects for the different intelligence- and achievement-based groups, we calculated two 5 x 2 (Training week x Subgroup) repeated measurement ANOVAs; the subgroups were operationalized via intelligence in the first analysis, and via achievement in the second. A significant interaction between Training week and Intelligence- or Achievement-based subgroup would indicate differential training effects; we did not observe such interactions (Intelligence groups: $F(4, 476) = 0.31$; $p = .87$; partial $\eta^2 = .00$; achievement groups: $F(4, 476) = 0.76$; $p = .55$, partial $\eta^2 = .01$). Fig. 2 shows the students' progress in the training task in the four subgroups.

Again, we also report effect sizes that are comparable across studies. We report the effect size *d* to describe the gain in finding main ideas in the course of the training. From Week 1 to Week 5, we found a medium-to-large training effect for the total sample, for students of high and of average intelligence, and for students with average scholastic achievement; for high achievers, the effect size was large (cf. Table 6, column on the right).

Table 6. *Number of Correctly Identified Main Ideas per Week and Effect Sizes d, by Intelligence- and Achievement-Based Subgroup*

		Number of correctly identified main ideas										Effect size d^b
		Week 1		Week 2		Week 3		Week 4		Week 5		Week 5 – Week 1
Subgroup	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	
All students	121	6.13	1.77	6.10	1.76	6.79	2.07	6.78	1.97	7.33	1.72	0.69
Top 10% intelligent	13[a]	7.49	1.46	7.26	1.56	7.95	1.91	8.08	1.62	8.35	1.27	0.63
Top 10% grades	11[a]	7.49	1.11	7.85	1.22	8.36	0.96	8.45	1.18	8.45	0.99	0.91
Bottom 90% intelligent	108[a]	5.98	1.74	5.96	1.74	6.65	2.06	6.63	1.96	7.21	1.73	0.71
Bottom 90% grades	110[a]	6.00	1.77	5.92	1.72	6.63	2.03	6.61	1.92	7.22	1.75	0.69

Note. [a] The Top-10%- and Bottom-90%-groups are not exactly 10% or 90% of the sample, because the grouping is based on percentile ranks (91st or higher for the Top-10%-group). [b] Effect size was computed as $d = (M_A - M_B)/SD_{AB}$ with $SD_{AB} = \sqrt{(SD_A^2 + SD_B^2)/2}$ (cf. Bortz & Döring, 2006, pp. 606-607, formula 9.1 and 9.3; we chose this formula to facilitate comparisons with other studies, cf. p. 609).

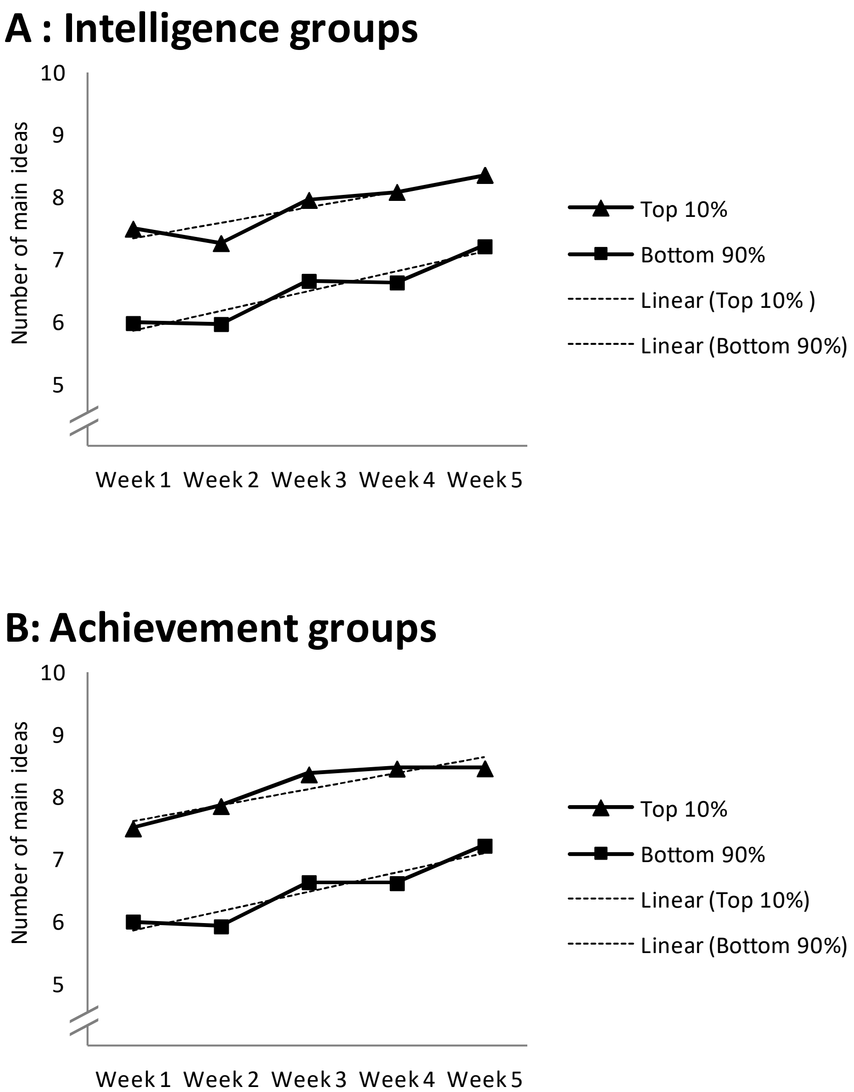

Figure 2. *Number of correctly identified main ideas per week. Panel A: Highly intelligent students vs. students of average intelligence. Panel B: High-achieving students vs. averagely achieving students*

4. Discussion

Our aim in this study was to examine if highly intelligent and high-achieving students can benefit from a training of self-regulated learning (SRL) conducted in a regular classroom context as much as their peers of average intelligence and with average scholastic achievement. To this end, we compared fourth-graders who participated in an SRL training program in their regular classroom context (SRL condition) with fourth-graders who received regular classroom instruction (REG condition). In differential analyses, we examined the training effects on highly intelligent students (top 10%) and on high-achieving students (top 10%) as well as on their peers of average intelligence and on their peers with average scholastic achievement. We examined the effect gain (post-test group differences between students in different training conditions adjusted for pre-test group differences for students in different training conditions) for preference for SRL immediately after the end of the training (T2, post-test) and another 11 weeks later (T3, follow-up). We also examined the progress in the training task of identifying main ideas in an expository text for students participating in the program. In differential analyses, we compared the progress of highly-achieving and of highly intelligent students with the progress of their respective peers of average intelligence and with average scholastic achievement.

Our results showed the general effectiveness of the SRL training for students in all intelligence- and achievement-based subgroups with regard to preference for SRL and to the training task of identifying main ideas. We did not find differential effects for students in different intelligence- or achievement-based subgroups. However, small interaction effects might have gone undetected due to low statistical power that resulted from the small sample sizes in the top-10% groups. To get a more comprehensive picture, we also reported the size of training effects for the overall sample and for every intelligence- or achievement-based subgroup. In the following, we will focus on the effects for highly intelligent and high-achieving students.

Highly intelligent students who participated in the training demonstrated an increased preference for SRL in the long run, while highly intelligent students in regular instruction showed no long-term increase in their preference for SRL. This resulted in a medium long-term training effect (cf. Fig. 1 and Table 5). Immediately after the training, we found no training effect for highly intelligent students, as highly intelligent students in the regular instruction condition had also increased their preference for SRL. The increase for students in the regular instruction condition was not expected, and apart from the possibility of a measurement artifact, we cannot think of a conclusive post-hoc explanation for this phenomenon. In our opinion, the positive long-term training effect is more relevant for students as it indicates that they maintained the preference for self-regulated learning even when external support was reduced.

High-achieving students clearly benefited from the program with regard to preference for SRL. Participating high achievers demonstrated an increased preference for SRL immediately after the training and a further increase in preference for SRL in the long term, while high achievers in regular instruction showed the opposite pattern: decreased preference for SRL in the short term and a further decrease in preference for SRL in the long term. This pattern resulted in a medium immediate training effect and a large long-term training effect. The effects for high-achieving students are larger than the effects for any other intelligence- or achievement-based subgroup.

Highly intelligent students improved their performance in the training task in the course of the training (medium-to-large effect, cf. Fig. 2 and Table 6). This is especially noteworthy as their performance in the first practice week of the training was already relatively high. Further analyses showed that highly intelligent students – like students of average intelligence and students with average scholastic achievement – improved their performance in the first and in the second half of the program's practice phase, with a nominal increase of 0.46 main ideas from PW 1 to PW 3 and of 0.40 main ideas from PW 3 to PW 5. The overall increase of .86 main ideas from PW 1 to PW 5 was highly significant (p = .01).

The baseline situation for high achievers was almost identical to the baseline situation of highly intelligent students: They also started with relatively high values in the first practice week. High-achieving students also benefited from the program, and in fact, the training effect for this group was the largest of any of the intelligence- or achievement-based subgroups again. Moreover, the pattern of when the increase in number of correctly identified main ideas occurred for high achievers is noteworthy: With a nominal increase of 0.87 main ideas from PW 1 to PW 3 and of only 0.09 main ideas from PW 3 to PW 5, the large training effect occurred already in the first half of the program's practice phase and remained stable thereafter. Again, the overall increase of 0.96 main ideas was highly significant.

4.1. General conclusions

Although we detected no differential effects for students in different intelligence- or achievement-based subgroups in ANOVA analyses, a comparison of effect sizes suggests that high achievers might have benefited even more than any other subgroup and that highly-intelligent students might have benefited more than students of average intelligence and students with average scholastic achievement in terms of long-term effects on SRL.

Larger effects for high achievers might be explained by the Matthew effect (Walberg & Tsai, 1983), according to which students with higher baseline values benefit more from instruction than students with lower baseline values. It is also possible that high achievers in the training group had an advantage in terms of previous knowledge and willingness to self-regulate their learning (mirrored by their high baseline preference for SRL) and that this enabled them to focus their attention on those components of the training that helped them improve their learning behavior and achievement. Finally, the subgroup of high achievers is the most homogenous of all subgroups in terms of achievement (cf. *SD*s in Table 6), which means that the same increase in number of correctly identified main ideas resulted in a larger effect size than in the other, more heterogeneous groups.

The training effects for highly intelligent students were somewhat smaller than the effects for high achievers, and only the effects on preference for SRL were larger than for their peers of average intelligence. Highly intelligent students' baseline value in SRL does not exceed their peers' baseline value, so the Matthew seems not to apply here. The fact that training effects on preference for SRL were larger for highly intelligent students than for their peers of average intelligence could be explained by their greater aptitude to select, remember and automatize (e.g., Sternberg, 1986) the most important aspects of this rather complex training. In comparison to the high achievers, highly intelligent students seem to have had less previous knowledge and willingness to self-regulate their learning and might be generally less keen to meet school's academic demands, which could have contributed to the comparably smaller effects.

4.2. Practical implications

We showed that high achievers and highly intelligent students can benefit from an SRL training program in a regular classroom context and can therefore dispel concerns that these students might not benefit from such a program. We can recommend the program we used in our evaluation for use in heterogeneous classrooms. To achieve the desired effects, it is essential that teachers understand what the crucial components in the program are and emphasize them in their teaching: teach strategies explicitly, give students ample opportunity to practice newly acquired strategies and learning behavior, offer systematic feedback on students' improvements in learning behavior and achievement gains and, thereby enabling students to see the relationship between learning behavior and achievement. We recommend adjustments to the program evaluated in this study only in the special case of a classroom with a large number of high-achieving students. In this case, more challenging texts could be used to allow achievement gains in the second half of the practice phase. This adjustment is relatively time-consuming and complex, as texts have to be rewritten in a way ensuring that all 25 texts are still of comparable difficulty. We do not recommend shortening the practice phase to three weeks, as students need time to internalize the new learning behavior. Instead, we would recommend more refined feedback on the strategy use, supporting students in "fine-tuning" their strategy use. With all this being said, our findings should generalize to other programs that feature the aspects enumerated above and that ensure that tasks are both manageable and challenging, thereby allowing all students to have achievement gains over time. Programs that have already been evaluated for the target group are preferable, but when programs are not available for a given target group or subject matter, we encourage teachers to integrate as many of the crucial training aspects as possible into their regular teaching routines (cf. Perry & Rahim, 2011).

4.3. Limitations and future directions

Finally, we would like to mention limitations of our study and make suggestions for future research. First, we used a self-report questionnaire to measure self-regulated learning. Due to economic constraints, we did not measure students' actual behavior, but asked students to self-report their preference for self-regulated learning over externally regulated and impulsive learning. Self-report data can be distorted by social desirability and should not be interpreted as actual behavior. Therefore, in future research, this measure should be supplemented by measures that are closer to actual student behavior, for example by learning journals (cf. Schmitz, Klug, & Schmidt, 2011), think aloud protocols (cf. Green, Robertson, & Croker Costa, 2011), or microanalytic assessments (cf. Cleary, 2011).

Second, we limited our analyses to students without migration background after we had found effects of students' migration status in the larger evaluation study. This choice enabled us to keep the focus on highly intelligent and high-achieving students and to keep the manuscript readable. A drawback of this choice is that we cannot say for sure how our results generalize to highly intelligent and high-achieving students with migration background. A challenge in addressing this issue in future research is posed – at least in some areas – by the comparably smaller number of students with migration background in many regular classrooms. As highly intelligent and high-achieving students are, by definition, also small in number, a combination of these characteristics may result in sample sizes too small for quantitative research. We therefore believe that case studies (cf. Butler, 2011) could be an appropriate and valuable method for addressing this issue in future research. Alternatively, the study could be replicated in classrooms with larger proportions of students with migration background, either in areas where this is the norm rather than the exception or by way of selectively recruiting participating classrooms.

A final limitation concerns the rather low statistical power to detect three-way interaction effects in the differential analyses. This is a common problem in research with individuals who share a rare characteristic like high intelligence or high academic achievement, resulting in small group sizes. We addressed this issue by supplementing our ANOVA analyses with effect size measures for all intelligence- and achievement-based subgroups. We recommend a similar approach in future studies that attempt to replicate our findings. In addition, when more similar studies are conducted, the pooling of samples could be considered to achieve larger sample sizes.

In summary, we showed that highly intelligent and high-achieving students can benefit from a training program in self-regulated learning conducted by regular classroom teachers in heterogeneous classrooms. Future research should replicate these findings using the same or similar training programs and various assessment methods. Extending our findings to other content areas and to students of other age groups is also desirable.

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V. Artikel 4

Sontag, C., & Stoeger, H. (under review). Are inaccurate self-assessment and unrealistic goal-setting among elementary school students related to memory deficits and wishful thinking?

Gliederung (Artikel 4)

Are Inaccurate Self-Assessment and Unrealistic Goal-Setting Among Elementary School Students Related to Memory Deficits and Wishful Thinking?

Are Inaccurate Self-Assessment and Unrealistic Goal-Setting Among Elementary School Students Related to Memory Deficits and Wishful Thinking?

Abstract. In self-regulated learning theory, self-assessment and goal-setting are considered important processes. We examined two potential reasons for inaccurate self-assessments and unrealistic goal-setting among older elementary school students: memory deficits and wishful thinking. Fourth-grade students (N = 24) worked on a daily reading task for two weeks and recorded their task-related weekly goals, daily self-assessments and performances. We also conducted two one-on-one interviews with each student in which we asked them to remember their previous performances in the reading task, to state their wishes for the reading task and to report their reasons for specific task-related self-assessments and goals. Overall, students' memory of their previous performance was quite accurate, and we found no relationship between inaccurate memory and inaccurate self-assessment and no relationship between inaccurate memory and unrealistic goals. Most students also distinguished well between wishes on the one hand and self-assessments and goals on the other. We found no relationship between wishful thinking and inaccurate self-assessment, but a relationship between wishful thinking and unrealistic goal-setting. Finally, the interview data show that less than a fifth of the students consciously use their memory of previous performances for self-assessment and less than half of the students consciously use it for goal-setting. Educational implications are discussed.

Keywords: self-assessment, goal-setting, calibration accuracy, performance prediction, elementary school students, self-regulated learning.

In current theories of self-regulated learning, learners are seen as active participants in their own learning (cf. Zimmerman & Schunk, 2011). In order to self-regulate the learning process, learners have to self-regulate and coordinate different sub-processes, such as self-assessment, goal-setting, planning, strategy use and monitoring, and outcome evaluation (e.g., Ziegler & Stoeger, 2005; Zimmerman, 1986). Self-regulated learning (SRL) develops with age and with practice (cf. Bronson, 2000 for an overview) and can be considerably improved by employing effective training programs (Dignath & Büttner, 2008). The present study focuses on two aspects of self-regulated learning that are crucial early in the learning process: self-assessment (before tackling a task) and goal-setting. We deem it possible to improve existing intervention approaches that help learners optimize these processes, if we understand the reasons for inaccurate self-assessment and unrealistic goal-setting better than we currently do. In the present study, we focus on older elementary school students. In this age group, some students already make accurate self-assessments and set realistic goals for themselves, but many do not (Schunk & Pajares 2002; White, Hohn, & Tollefson, 1997). Building on experimental research on self-assessments among younger children (Visé & Schneider, 2000), we examine memory deficits (Parsons & Ruble, 1977; Shaklee & Tucker, 1979) and/or wishful thinking (Dweck, 2002; Stipek, 1984) as potential reasons for inaccurate self-assessments and unrealistic goal-setting among older elementary school students. To address the scarcity of research on possible reasons for inaccurate self-assessments and for unrealistic goal-setting in “real life” settings, we employ a school-related task in a school setting.

1. Theoretical and Empirical Framework

According to Ziegler and Stoeger’s (2005) normative model of self-regulated learning, self-assessment (before tackling a task) and goal-setting are important aspects of SRL that are theoretically related in that learners should use the results of the self-assessment to set adequate goals for themselves. In the following, we will explain what we mean by “accurate self-assessment” by giving a short overview over constructs that are affiliated with self-assessment. We focus on performance predictions as this is the paradigm used in the current study. We will then review literature on the accuracy of self-assessments among elementary school students, discuss possible reasons for inaccurate self-assessment, and describe how self-assessment relates to goal-setting and subsequent phases of the self-regulated learning process. Afterwards, we clarify what we mean by “realistic goals”, explain our focus on performance goals (sensu Locke & Latham, 2002) in the current study and discuss possible reasons for unrealistic goal-setting.

1.1 Accurate Self-Assessment

Psychological and educational research on self-assessment makes use of several related, but delimitable concepts (Pajares, 1996; Schneider, 1998; Schunk & Pajares, 2002; Stipek & MacIver, 1989). Self-assessment can be rather general (e.g., academic self-concept, self-esteem) or more specific (e.g., performance predictions for answering questions on a scientific text) and it can be relevant at specific points of time during the learning process (e.g., self-efficacy before tackling a learning task; progress monitoring during a learning task; and self-evaluation of learning outcomes after finishing a task). In this article, we focus on the task-specific self-assessment right before a learning task is tackled. We chose to work with the paradigm of performance predictions for three reasons: First, as performance predictions are task specific, we can directly compare them to students’ actual performance and calculate measures of prediction accuracy, which is an important requirement for examining reasons for inaccurate self-assessments. Second, the paradigm of performance prediction is well-established in developmental research and has been shown to work well with elementary school students (e.g., Visé & Schneider, 2000). Third, performance predictions are well-suited for use in an academic school context (Cleary, 2009).

From a self-regulated learning perspective (e.g., Ziegler & Stoeger, 2005), self-assessments should be accurate in order to provide a good basis for the selection of a “realistic” goal (i.e., goals that are challenging: difficult and attainable at the same time; White et al., 1997; Zimmerman, 2008a) and for adequately planning the learning process as well as the use of cognitive strategies (Pajares, 1996; Zimmerman, 2008b).

1.2 Possible Reasons for Inaccurate Self-Assessment

Generally, inaccurate self-assessments can be observed in individuals of all ages and in various domains (Alba & Hutchinson, 2000; Kruger & Dunning, 1999). The accuracy of self-assessments depends on many factors, for example on task familiarity, on task difficulty, on task complexity, and on how obvious the difficulty of a task is (Butler & Cartier, 2004; Cleary, 2009; Schneider, 1998; Schunk & Pajares, 2002). There is also a characteristic developmental trend in the accuracy of self-assessments:

Younger children (pre-school and early elementary school) tend to overestimate their skills, whereas older children (at the end of elementary school) become more realistic in their self-assessments, and some older elementary school students may even systematically underestimate their skills (Schunk & Pajares 2002; Stipek, 1998; Stipek & MacIver, 1989).

In addition to the age-independent reasons for inaccurate self-assessments mentioned in the previous paragraph, age-specific reasons that might explain inaccurate self-assessments in younger students (pre-school, early elementary school) are discussed in literature focusing on the developmental perspective (Nicholls, 1978; Schunk & Pajares, 2002; Visé & Schneider, 2000). Two of these potential reasons are of particular interest to us, as they could also be relevant for older elementary school students in realistic school contexts and could possibly be addressed in interventions: memory deficits (Parsons & Ruble, 1977; Shaklee & Tucker, 1979) and wishful thinking (Stipek, 1984).

The memory deficit hypothesis posits that children fail to remember their previous performance in similar tasks and/or fail to use their memory of previous performances in similar tasks when making self-assessments (Parsons & Ruble, 1977, Shaklee & Tucker, 1979). Such memory deficits could explain both overestimations and underestimations. Schneider (1998) and Visé und Schneider (2000) examined potential memory deficits by asking four-, six-, and nine-year old children to remember their performances in two motor tasks and in two memory tasks. They found that all children could accurately remember their previous performances shortly after finishing the task. The authors concluded that a potential memory deficit does not consist of failing to remember past performances accurately but may consist of the failure to use this performance information for self-assessments. The study makes an important contribution to our understanding of inaccurate self-assessments among children but is limited in two aspects: (a) It was not examined how accurately children could remember past performances over a longer period of time; and (b) it was not examined whether children *use* their memory of previous performances in their self-assessments.

The second approach to explain inaccurate self-assessments that is relevant for our purpose is the wishful thinking hypothesis (Stipek, 1984; see also Dweck, 2002). It builds on Piaget's (1930) observation that young children often do not differentiate between their wishes/desire and their expectations. When students are asked to make self-assessments in the form of performance predictions, they should refer to their expectations, not to their wishes. Stipek (1984) proposed that student's inability to distinguish between wishes/desire and expectations may lead to inaccurate self-assessments in performance predictions. The wishful thinking hypothesis applies only to overestimations. In her experimental laboratory study Stipek (1984) found indirect evidence that 4-year-olds may in fact confuse wishes with their expectations when making performance predictions: In contrast to children in a control group who adjusted their expectations over the course of some trials at least a bit, children who were promised incentives contingent on a positive outcome remained overly optimistic. Schneider (1998) used a between-subject-design to examine the wishful-thinking hypotheses more directly. Children (4- and 6-year-olds) in the "Wish" condition were asked to state the outcome they *wished* to attain in two motor tasks and in two memory tasks directly before tackling each task. Holding everything else constant, children in the "Expectation" condition were asked to state the *expected* outcome. There was no effect of experimental condition, thus providing more evidence that young children might not be able to differentiate between their wishes and their expectations. Visé and Schneider (2000) replicated this finding for 4- and 6-year-olds. For 9-year-old children, they found differences between the "Wish" and the "Expectation" condition only in one of the four tasks, long jump, a task that children had previously judged as easy and familiar (Schneider, 1998). This result indicates that wishful thinking might be a source for inaccurate assessments even in older elementary school students.

1.3 Realistic Goal-Setting

Goals have been described as the object or aim of an action, usually within a given period of time (Locke & Latham, 1990; 2002). Goals also provide a standard for (self-)evaluation and for judging satisfaction (Bandura, 1986; Locke & Latham, 1990; 2002). Goals are especially advantageous for the learning process, if they are specific, proximal and challenging (Locke & Latham, 1990, 2002; Zimmerman, 2008a). Challenging goals that are simultaneously difficult and attainable have also been termed "realistic" goals (e.g., White et al., 1997). Goals can also be characterized by their focus: 'learning goals' focus the learner's effort on enhancing the learning process whereas 'performance goals' focus the learner's effort on achieving a certain performance outcome (Locke and Latham, 1990). Performance goals can easily be operationalized in a way that allows the comparison between goal and actual performance, thus offering an estimate of how realistic the goal was. For this reason, we will focus on performance goals in the current study.

Given the fact that goal-setting is a research topic in motivational, educational and developmental psychology and that it is a key factor in all current models of self-regulated learning (Zimmerman & Schunk, 2011) a systematic literature search yielded surprisingly little published empirical research on how realistic elementary school children are in their goal-setting (cf. Wigfield, Klauda, & Cambria, 2011, who also note the scarcity of empirical research on children's goal-setting processes). The study by White et al., 1997 is one exception. However, the authors used "goal-setting" and "performance prediction" interchangeably in their instructions to students, blurring the lines between the two concepts. They examined second- to fifth-graders' goal-setting in a tossing game (6 trials) and in a weekly spelling test (4 trials). Students received feedback on their performance and rewards for setting realistic goals/making accurate predictions in both activities. The authors found no significant grade differences and reported that, although unrealistic goals dominated initially, more than half of the students learned to set realistic goals during the tossing trials, and two thirds of the students learned to set realistic goals in the course of four weeks. Conversely, this result also means that almost half respectively one third of the students still set unrealistic goals/made inaccurate predictions in the last trial. Obviously, these students did not respond to feedback and incentives in the same way as the others. The reasons for this behavior were not examined in the study.

1.4 Reasons for Unrealistic Goal-Setting

To the best of our knowledge, there is no published research explicitly examining reasons for unrealistic goal-setting. We find it plausible to examine both memory deficits (Parsons & Ruble, 1977; Shaklee & Tucker, 1979) and wishful thinking (Stipek, 1984) as possible reasons for unrealistic goal-setting in elementary school students. Our opinion is based on research on self-regulated learning and supported by theoretical literature on goal-setting. Research on self-regulated learning suggests that most elementary school students do not consciously self-assess their abilities prior to setting a goal for themselves (Sontag, Stoeger, & Harder, 2012). As a consequence, the same mechanisms that apply to self-assessment could also be relevant for goal-setting: Students' goals will be more unrealistic if they fail to use their memory of past achievements for goal-setting, and their goals will be more unrealistic if they are not aware of the difference between a wish and a goal. These assumptions are supported by theoretical considerations from motivational goal-setting literature that also show the importance of taking into account past achievements in goal-setting and of differentiating goals from pure wishes (Oettingen & Stephens, 2009).

1.5 Present Research

The purpose of our study was to examine memory deficits and wishful thinking as two potential reasons for inaccurate self-assessments and for unrealistic goals among older elementary school students. As most relevant research was conducted in artificial laboratory settings, we aimed at answering our research questions in a more naturalistic school-setting. We chose reading as the domain for our research, as reading is relevant in almost all school subjects, and we used a reading task that allowed us to directly compare self-assessments (operationalized as performance predictions) and performance goals (sensu Locke & Latham, 2002) with students' actual performance.

Specifically, we were interested in three questions: (a) Is memory accuracy related to accuracy in self-assessments and in goal-setting? We hypothesize that the more students falsely remember high performances in previous tasks the more they overestimate their future performance when asked to predict it, and the more they set unrealistically high goals for themselves. In contrast, the more students falsely remember low performances the more they underestimate their future performance and the more they set unrealistically low goals. (b) Is wishful thinking – manifested as the failure to distinguish between wishes on the one hand and self-assessment or goals on the other (cf. Stipek, 1984; see also Dweck, 2002) – related to inaccurate self-assessment and unrealistic goal-setting? We hypothesized that, when students are asked to predict their performance, students who do *not* distinguish between wishes and self-assessments would overestimate their performance more than students who do distinguish between the two concepts. Also, we assume that students who do *not* distinguish between wishes and goals set unrealistically high goals for themselves, and that their goals are more unrealistically high than the goals of students who do distinguish between wishes and goals.

As little is known about what kind of information elementary school students use consciously in self-assessments and goal-setting, we also (c) explored whether students are aware of their own reasons for self-assessments and goal-setting, in particular: Do students consciously refer to their previous performances when making a self-assessment or when setting a goal? Do students consciously refer to their wishes when making a self-assessment or when setting a goal?

2. Method

2.1 Participants

Study participants were 24 students (50% female) from two different fourth-grade classrooms in Germany. Their mean age was 10.43 years (*SD* = 0.48). We selected students to participate in the study based on their own and their parents' consent to participate and with the aim of an equal gender distribution. Two participants (8.33%) had a migration background, that is, they themselves and/or at least one of their parents were not born in Germany. None of the students had a diagnosed learning disability, and all students achieved at least average scores in a standardized reading (text comprehension) test conducted earlier in the school year.

2.2 Measuring Instruments

As *demographic data*, we obtained students' gender, and age, as well as their and their parents' country of birth. *Students' self-assessments*, *goals* and *actual performance* were measured with a repeated reading task: During two weeks, students read a short (ca. 420 words / one A4-page), low-level scientific text on every school day. Their task was to identify the ten main ideas in each of the ten texts. The texts – taken from a published book (Stoeger & Ziegler, 2008) – contained ten main ideas each, and were comparable in structure and difficulty. Students received the texts in two booklets, one booklet for each "reading week". In the following, we will describe the structure and content of the reading booklets. Details of how the students worked with the booklets are described in the Procedure section (section 2.3.).

Each booklet begins with an explanation of the task and a prompt to set a weekly goal. Specifically, the students are asked to set and write down a performance goal ("My goal is to find x out of the 10 main ideas."), which we could later compare to their actual performance. In the booklet, each text is followed by a prompt for a performance prediction ("What do you think: How many of the 10 main ideas will you find?") that served as a measure of self-assessment. The performance prediction is followed by a lined page on which students can write down the ten main ideas, and a blank page on which they can paste the correct solution afterwards. Students are asked to compare their own solution to the sample solution and to write down the number of correctly identified main ideas. This number served as measure of actual performance. The first booklet ends with a prompt to set an outcome goal for the second week. The second booklet is essentially the same as the first, except that students are asked to copy the goal they set at the end of the previous week onto the first page, and that there is no prompt for goal-setting on the last page.

Students' *reasons for making a specific self-assessment and for setting a specific goal*, their *memory of previous performances*, and their *wishes* – as opposed to self-assessments and goals for the same task – were collected in structured interviews. The interviews were closely related to the reading task and scheduled during the reading weeks. The exact wordings of the interview questions and their sequencing are described in the Procedure section (section 2.3). To minimize interference effects, we designed two separate interviews, one on self-assessment and one on goal-setting, and scheduled them for different days (cf. Table 1). We scheduled interviews on self-assessment for Thursdays and interviews on goal-setting for the Monday of the second reading week. At the point of the interview, students have read the text of the current day once in class and completed the self-assessment for it but have not worked on finding the main ideas yet. To counteract order effects, students in one classroom were scheduled to start with the interview on self-assessment on the Thursday of the first reading week and to be interviewed on goal-setting on the Monday of the second reading week. Students in the other classroom had their first interview about goal-setting on the Monday of the second reading week and their second interview about self-assessment on the Thursday of the second reading week.

Table 1. *Interview Schedule*

	Reading week 1					Reading week 2				
	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri
Classroom 1				s.-a.		g.-s.				
Classroom 2						g.-s.			s.-a.	

Note. s.-a. = interview on self-assessment; g.-s. = interview on goal-setting.

2.3 Rationale for Accuracy Measures and Measure of Wishful Thinking

In order to answer our research questions, we used the measures collected in the reading booklets and the interviews to calculate measures of accuracy for self-assessments, goal-setting, and memory as well as a measure of wishful thinking. In the following, we will explain the rationale for our choice of calculated measures. We will provide details of the calculations in the Results section (cf. section 3.2 for the accuracy measures for self-assessment and goal-setting; section 3.3 for the accuracy measure for memory; section 3.4 for the measure of wishful thinking).

Different accuracy measures (also called “calibration statistics”) have been proposed and used in metacognitive research (e.g., Schneider, 1998; Visé & Schneider, 2000; for overviews cf. Boekaerts & Rozendaal, 2010; Schraw 2009; Schraw, Kuch, Gutierrez, & Richmond, 2014). Generally, two types of measures can be distinguished: measures with a focus on the consistency of metacognitive judgments in a set of tasks (correlational measures) and measures with a focus on the extent of inaccuracies in judgments (e.g., absolute accuracy; bias). Both types of measures are available for dichotomous and for continuous data.

For our purpose, it was crucial to know the extent of an inaccuracy, and, moreover the direction of the inaccuracy (over-/underestimation; goals set too high/too low). For this reason, and because our measures of self-assessment, goal-setting, actual performance and memory of the performance all were on a continuum (0-10 main ideas), we used the *bias* measure as described by Visé & Schneider (2000). It shows by how much each student under- or overestimates him- or herself. When calculating the *bias* measure for different assessments by the same student or for a group of students, it is important to understand that over- and underestimations may cancel each other out. For this reason, we focused on one self-assessment by each student in our sample when examining the reasons for inaccurate self-assessments and unrealistic goal-setting. Additionally, we report the percentage of children who underestimate, accurately estimate and overestimate themselves to describe the sample as a group.

The wishful thinking measure was derived on theoretical grounds (Dweck, 2002; Stipek, 1984) and is consistent with prior research (Schneider, 1998, Visé & Schneider, 2000; cf. Section 1.2.). Students who do not distinguish between their wishes on the one hand and their self-assessment or goals on the other, are categorized as wishful thinkers, whereas the other students are categorized as non-wishful thinkers.

2.4 Procedure

We conducted the study in four parts: (a) students first provided demographic information, and then (b) received a lesson introducing them to the reading task and the underlining technique. This was followed by (c) two reading weeks with daily classroom sessions and daily reading tasks, and (d) two interviews. Two research assistants, one in each classroom, conducted the study during regular classroom hours. All students in the two classrooms participated in parts *a* through *c*, but data were collected only from students who consented to participate in the study. Each study participant was interviewed (part d) twice during the reading weeks.

At the beginning, the research assistant introduced herself and informed the students about the study. Then, students filled in the questionnaire on demographic information (part a). The 45-minute introductory reading strategy lesson (part b) was held to familiarize the students with the task in the two reading weeks. In this lesson, the research assistant talked about how students could identify the main ideas in basic science texts and showed them that underlining them is a helpful technique. Specifically, the research assistant showed an example containing common mistakes when using the underlining technique (e.g. overuse of underlining, underlining interesting but irrelevant information) and discussed them with the students. In addition, a correct example was modeled. Finally, students received a worksheet and summarized tips on how to identify main ideas using the underlining technique. Self-assessment and goal-setting were not discussed in the introductory lesson. Parts a and b served the additional purpose of building rapport between the students and the research assistant.

In the two reading weeks (part c), we collected information on the students’ weekly goals, their daily self-assessments, and their performance in daily reading tasks. On Monday of the first reading week, the research assistant informed the students that they were going to work on a different text each day in the ensuing two weeks and that their task was to identify the main ideas in each text. The research assistant also told the students that each text contained exactly 10 main ideas and that the texts were of a comparable difficulty level. She handed out the booklet for the first week and informed the students that the tasks in the booklets would not be graded, but that it was important to do one’s best. Then she asked the students to set a goal for themselves for the first week. The prompt in the booklet read: “My goal for this week is to find …… main ideas”; the numbers from 1 to 10 were printed in the blank and students were asked to circle one number. After this, the research assistant chose one student to read the first text aloud while the other students read along silently, and students had the opportunity to ask for unknown words to be explained by peers or the research assistant. Students were then asked to make a self-assessment in the form of a performance prediction and write it in the booklet.

Students took the booklet home to work on it as part of their homework assignments. They were asked to write down the ten main ideas on ten numbered lines. On the next day, the research assistant presented the correct solution and handed it out on a sheet of paper. Students pasted the correct solution in the booklet and used it to correct their own homework. All students had the opportunity to ask the research assistant when in doubt and finally wrote down the number of correctly identified main ideas. The research assistants double-checked this number for the students participating in the study.

Then, the procedure described for Monday was repeated, starting with one of the students reading the next text aloud. The students worked on the texts as part of their homework assignments Monday to Thursday. On Friday, the students worked on the text at school, and corrected their solutions immediately afterwards. The week ended with the research assistant asking the students to set a goal for the next week and to note it on the last page of their booklet. The second week started with students copying the goal they set on Friday into the new booklet, which contained the five texts for the second week. The procedure in the second week was essentially the same as in the first week, with the exception that students did not set another goal on Friday.

During the two reading weeks, the research assistant conducted one-on-one interviews (part d) with each participating student in a quiet area outside the classroom. Each student was interviewed twice, once on self-assessment (Thursdays) and once on goal-setting (Mondays) (cf. Table 1). The interviews lasted between 4 and 6 minutes per interview and student. All interviews were digitally recorded.

In the Thursday interview about self-assessments, the research assistant began the interview by asking the student to open his or her booklet on the page with Thursday's text, where the students had just written down the respective self-assessment. Then she asked the student "Here you were asked: 'What do you think: How many main ideas will you find?' – Why did you write [number in the student's booklet]?" After the student answered, she asked: "Do you remember how many main ideas you found in the texts this week?" If a student did not provide answers for all three texts, the research assistant prompted the student with the day and the title of the text, starting with the previous day ("…yesterday in the text about 'hearing'?") and then working backwards. The interview ended with the questions "If someone granted you a wish, how many main ideas would you like to find? – Why?". The interview on goal-setting was essentially the same, except that it started with Monday's text, all questions were formulated with regard to the goal students had set in the second week, and that students were asked to remember how many main ideas they had found every day of the previous week (resulting in five instead of three data points).

2.5 Data Preparation

We obtained data on students' daily self-assessments, their weekly goals and the number of correctly identified main ideas per text directly from the students' reading booklets. The interviews were transcribed literally, following rules by Kuckartz, Dresing, Rädiker and Stefer (2008). From the transcripts, we took data on students' memories of their previous performance (three data points from the self-assessment interview and five data points from the goal-setting interview) and students' wishes (one wish from the self-assessment interview and one from the goal-setting interview). Students' reasons for making a specific self-assessment and for setting a specific goal were copied to a separate file and judged by two independent raters. For each answer, the raters decided (a) whether the students referred in their answer to their previous performance or not and (b) whether the students expressed a wish or not.

For example, the answer "…because of how many main ideas I found last week" was scored as a reference to previous performance; the answer "…because I hope to find as many as possible" was scored as referring to a wish. The statement "…because last week I had six, and now I want more" included both a reference to previous performance and to a wish, whereas the statement "just because" referred to neither. Inter-rater agreement (calculated as agreements / (agreements + disagreements)) regarding the reference to previous performance was 87.50% for the self-assessment interview and 100% for the goal-setting interview. For the reference to a wish, the inter-rater agreement came to 95.83% and 87.50%, respectively. Discrepancies were resolved in discussion.

3. Results

In this section, we will first provide descriptive statistics and correlations for the measures obtained in the reading booklet and the interview, and then describe how we calculated measures of accuracy for self-assessment, goal-setting and memory as well as a measure of wishful thinking. After that we will present the results to our research questions.

3.1 Descriptives and Correlations

Table 2 shows means, standard deviations and bivariate correlations (Kendall's τ) of measures obtained in the reading booklets and the interview. We present the weekly average for self-assessment, the weekly goals and the weekly average for performance as background information, because these data provide context for the answers to our research questions. Correlations between self-assessments and goals, and correlations between average weekly performance and average number of main ideas remembered in the interview were of medium size; correlations between the same constructs measured in different weeks were medium to high.

3.2 Calculated Measures of Accuracy for Self-Assessment and Goal-Setting

We report two measures of accuracy of students' self-assessments: The first measure, the *bias in self-assessment*, was used in further calculations to answer our research questions. It is calculated as the difference between the self-assessment and the actual performance in the reading task. A value of 0 indicates accurate self-assessment, negative bias values indicate that students underestimated their performance (theoretical minimum: -10), and positive values indicate that students overestimated their performance (theoretical maximum: +10). The second measure, the *percentage of students who underestimated, correctly estimated, and overestimated their performance,* was used to give additional background information. This seemed necessary, as positive and negative *bias* values may cancel each other out when group means are calculated so that a group of students may seem perfectly accurate in their self-assessments when in reality half the students overestimated their performance and the other half of the students underestimated their performance by the same amount.

Table 2. *Descriptive Statistics and non-parametric bivariate correlations (Kendall's tau)*

		M	*SD*	1	2	3	4	5	6	7	8	9	10
1	Av. SA, week 1	6.12	1.57	-									
2	Av. SA week 2	5.93	1.11	.39*	-								
3	Goal, week 1	6.25	2.44	.47**	.12	-							
4	Goal, week 2	7.17	1.88	.44**	.53**	.41*	-						
5	Av. performance, week 1	6.38	1.51	-.01	-.07	-.01	.05	-					
6	Av. performance, week 2	6.19	1.22	-.04	.03	.00	.08	.61**	-				
7	Av. memory in SA interview	6.54	1.81	.11	.20	-.12	.20	.53**	.57**	-			
8	Av. memory in goal interview	6.39	1.67	.13	.06	.07	-.01	.52*	.43**	34*	-		
9	Wish in SA interview	9.67	0.70	-.16	-.09	.09	.03	-.23	-.20	-.23	-.18	-	
10	Wish in goal interview	9.63	0.88	.16	.15	.34	.23	-.18	-.10	.07	.03	.64**	-

Note. Av. = average; SA = self-assessment. We used Kendall's tau rather than Spearman's rho as a non-parametric correlation measure because of the large number of tied ranks in most variables (cf. Field, 2009, p. 181).
**p* <.05, two-tailed. ***p* < .01, two-tailed.

We calculated two analogous measures to assess how realistic the students' goals were. The *bias in goal-setting* is calculated as the difference between the goal in the second reading week and the average performance in the reading task in the second reading week. Again, a value of 0 indicates that students set a realistic goal for themselves, negative values indicate that students set their goal too low, and positive values indicate that students set their goal too high[1]. As for self-assessment, we also report the *percentage of students who set their goals too low, who set realistic goals for themselves, and who set their goals too high* as background information. We categorized student's goals as too low if a student's goal was more than 0.5 main ideas below the student's average performance, and as too high if a student's goal was more than 0.5 main ideas above the student's average performance. In Table 3, we present the two measures for the daily self-assessments and the weekly goals.

3.3 Calculated Measures of Memory Accuracy

To quantify how well students remembered their previous performances, we report two measures: the *bias in memory* – used for further calculations to answer our research questions – and *the percentage of students who remembered too few, the correct number of, or too many main ideas* as additional background information. The *bias in memory* is calculated as the difference between the number of remembered main ideas for a given day and the number of correctly identified main ideas on the respective day. Again, a value of 0 indicates a perfectly accurate memory, negative bias values indicate that students remembered too few main ideas (theoretical minimum: -10), and positive values indicate that students remembered too many main ideas (theoretical maximum; +10). In addition to the bias in memory for every day, we report mean bias values per interview. In the self-assessment interview, this measure was calculated as the mean of the three daily bias values per student. In the goal-setting interview, we calculated two mean measures, one of the three most recent bias values (to be consistent with the self-assessment interview) and one of the five bias values (because it seems reasonable that students remember their performance for the whole previous week when setting a new weekly goal). The second measure is the *percentage of students who remembered too few, the correct number of, or too many main ideas*. For the mean measures per interview, we categorized students as having remembered too few main ideas if the number of main ideas the student remembered was more than 0.5 main ideas below the student's actual performance, and as having remembered too many main ideas if the number of main ideas the student remembered was more than 0.5 main ideas above the student's actual performance. Students that fell in between these boundaries were categorized as having correctly remembered their performance.

In five instances, students declared in the interview that they could not remember their previous performance for a given text; in these instances, and for students who missed a text, we could not compute the memory accuracy measures. Table 4 shows the two memory accuracy measures for the self-assessment interview and the goal interview.

[1] From a motivational perspective, it could be argued that goals set slightly too high (resulting in a bias measure of +1), are still functional or maybe even optimal, as they are appropriately challenging (cf. Locke & Latham, 1990). In this study, however, we are concerned with how realistic goals were, and we decided to define challenging goals that students still achieved (resulting in a bias measure between -0.5 and 0.5) as realistic goals. An added advantage of this definition is the consistency with the accuracy measures for self-assessment.

Table 3. *Accuracy Measures for Daily Self-assessments and Weekly Goals*

	Week 1						Week 2					
	Self-assessment					Goal	Self-assessment					Goal
	Mon	Tue	Wed	Thu	Fri	Week	Mon	Tue	Wed	Thu	Fri	Week
	n = 24	*n* = 23	*n* = 23	*n* = 24	*n* = 25	*n* = 24	*n* = 22	*n* = 23	*n* =24	*n* = 24	*n* = 22	*n* = 24
Bias (*M*)	0.63	-0.39	-0.48	-0.96	-0.42	-0.13	-0.45	0.96	-1.29	0.21	-0.73	0.98
Bias (*SD*)	(3.35)	(2.46)	(2.64)	(2.49)	(3.06)	(2.92)	(2.42)	(2.99)	(2.63)	(2.23)	(2.07)	(2.10)
% underestimated/too low	37.50	43.48	52.17	62.50	41.67	41.67	50.00	30.43	62.50	33.33	40.91	25.00
% accurate/realistic	16.67	17.39	13.04	8.33	25.00	16.67	18.18	21.74	12.50	20.83	27.27	8.33
% overestimated/too high	45.83	39.13	34.78	29.17	33.33	41.67	31.82	47.83	25.00	45.83	31.82	66.67

Table 4. *Accuracy Measures for Memory of Previous Performances in Both Interviews*

	Self-assessment interview				Goal interview						
	Mon	Tue	Wed	Mean	Mon	Tue	Wed	Thu	Fri	Mean3[a]	Mean5[b]
	n = 23	*n* = 23	*n* = 23	*n* = 24	*n* = 22	*n* = 23	*n* = 23	*n* = 23	*n* = 23	*n* = 24	*n* = 24
Bias (*M*)	0.57	0.61	-0.04	0.50	0.09	0.00	-0.26	-0.28	0.28	0.20	0.03
Bias (*SD*)	1.83	1.98	1.71	1.54	2.49	1.65	1.36	1.54	1.30	2.11	1.06
% too few	8.70	8.70	26.09	8.33[c]	27.27	30.43	39.13	30.43	26.09	25.00	29.17[c]
% correct	73.91	52.17	52.17	70.83[c]	54.55	39.13	34.78	43.48	43.48	45.83	45.83[c]
% too many	17.39	39.13	21.74	20.83[c]	18.18	30.43	26.09	26.09	30.43	29.17	25.00[c]

Note. [a] Mean3 = Mean calculated for the previous three days (Wed-Fri). [b] Mean calculated for the previous week (Mon-Fri).

3.4 Calculated Measure of Wishful Thinking

The measure of wishful thinking is different from the other calculated measures. As we described in Section 1.2, children who cannot or do not distinguish self-assessments from wishes are likely to name a wish when asked for a self-assessment, which would result in a too optimistic “self-assessment”. We therefore compared the number given as self-assessment on the day of the self-assessment interview with the number given as a wish on the same day. Students who stated the same number for both constructs were categorized as wishful thinkers. That was the case for only one student, who named ten main ideas both as self-assessment and as wish[2]. The other students seemed to distinguish well between self-assessments and wishes: In the self-assessment interview, the number of main ideas students had chosen for their self-assessment ($M = 6.21$, $SD = 1.74$, $Mdn = 6.00$) was significantly lower ($z = -4.16$, $p < .00$, $r = 0.60$[3]) than the number of main ideas they gave for wishes ($M = 9.67$, $SD = .70$, $Mdn = 10.00$).

Students who did not distinguish between goals and wishes, that is students who gave the same number of main ideas as their goal and as their wish in the goal-setting interview, were classified as wishful thinkers with respect to goal-setting. This was the case for three students who named ten main ideas both as goal and as wish.[4] The students in this sample generally distinguished well between goals and wishes: In the interview on goal-setting, the number of main ideas students had chosen as their goal ($M = 7.17$, $SD = 1.88$, $Mdn = 7.00$) was significantly lower ($z = -4.04$, $p < .00$; $r = 0.58$) than the number of main ideas they gave as their wishes ($M = 9.63$, $SD = 0.86$, $Mdn = 10.00$).

3.5 Relationship Between Memory Accuracy and Accurate Self-Assessments/Realistic Goal-Setting

To examine whether memory accuracy and accuracy in self-assessments are related, we correlated the mean bias for the memory of previous performances in the self-assessment interview (cf. Table 3) with the bias for self-assessment on the day of the self-assessment interview ($M = -.04$, $SD = 2.62$). We used Kendall’s τ as it is recommended as a non-parametric correlation measure for use in small samples with a large number of tied ranks (cf. Field, 2009, p.181). As Figure 1 illustrates, there was little variance in the bias in memory accuracy, and we found no significant relationship between the two variables ($\tau = -.01$; $p = .47$, one-tailed). Therefore, memory accuracy was not related to accuracy in self-assessment.

[2] A theoretical drawback of the wishful thinking measure is that students who are actually capable of identifying all 10 main ideas correctly and correctly say so in their self-assessment would be falsely labeled as wishful thinkers. However, this situation did not occur in our data set (see also Results, section 3.6).

[3] The effect size estimate r is calculated as $r = Z / \mathrm{SQRT}(N)$, in which Z is the z-standardized Wilcoxon signed-rank statistic and N is the number of observations. A value of r greater than .5 is considered a large effect (cf. Field, 2009, p.558).

[4] The theoretical drawback of the wishful thinking measure discussed for self-assessment applies to goal-setting as well: Students who are actually capable of identifying all 10 mean ideas correctly and set their goal accordingly would be falsely labeled as wishful thinkers. However, this situation did not occur in our data set (see also Results, section 3.6).

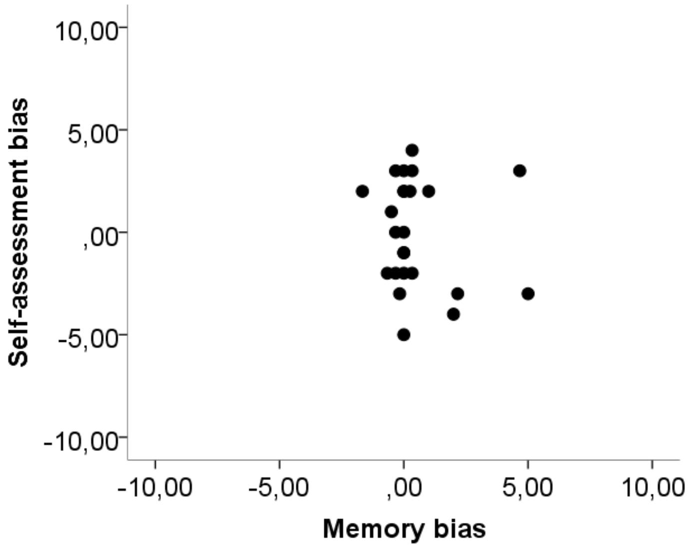

Figure 1. *Relationship between bias in memory and bias in self-assessment*

To analyze the relationship between memory accuracy and accuracy in goal-setting, we correlated the mean bias for the memory of previous performance in the goal-setting interview (cf. Table 3) with the bias in goal-setting in week 2 (cf. Table 2). To be consistent with the analysis for memory accuracy and self-assessment, we used the mean bias of the memory of the three previous performances as indicator of memory accuracy. Again, we found little variance in the memory accuracy measure and no significant relationship between the two variables (cf. Figure 2; $\tau = -.01$; $p = .47$, one-tailed). This result did not change substantially, when we used the mean bias of the memory of the five previous performances (i.e. the whole previous week) as indicator of memory accuracy ($\tau = -.09$; $p = .28$, one-tailed). Therefore, memory accuracy was not related to accuracy in goal-setting.

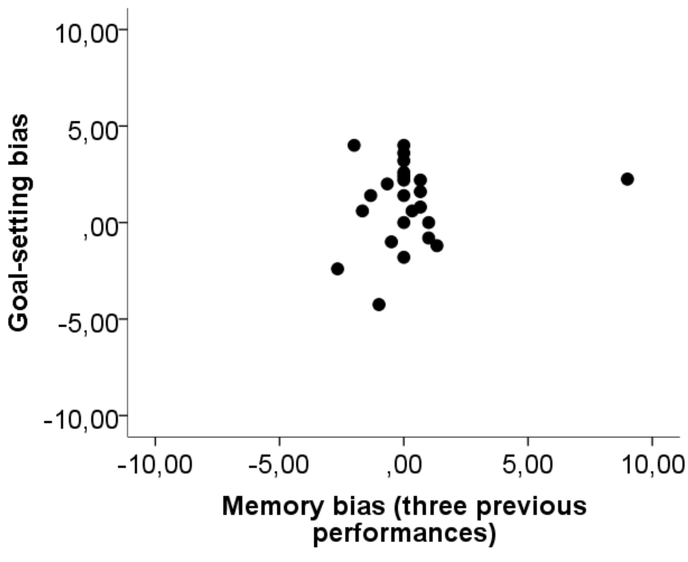

Figure 2. *Relationship between bias in memory and bias in goal-setting*

3.6 Relationship Between Wishful Thinking and Overly Optimistic Self-Assessments/Unrealistically High Goal-Setting

As we hypothesized that students who do not distinguish between wishes and self-assessments would overestimate their performance more than students who do make the distinction, we had originally planned to compare the mean bias in self-assessment on the day of the interview in these two groups of students. However, only one student failed to make the distinction between wish and self-assessment; we therefore report only descriptive statistics. The wishful-thinking-student's bias was +3 main ideas. The bias in self-assessment for the other students ranged from -5 to +4 main ideas (M = 0.18, SD = 2.61). As we unexpectedly found that wishful thinking regarding self-assessment was such a rare occurrence in our sample of fourth-graders, we did not formally test our hypothesis that wishful thinking is related to overly optimistic self-assessments.

For goal-setting, we hypothesized that students who did not distinguish between wishes and goals would set unrealistically high goals for themselves, and, that their goals would be more unrealistically high than the goals of students who did distinguish between wishes and goals. And indeed, the three students in our sample who showed wishful thinking all set overly optimistic goals (with a bias in goal-setting of 3.60; 4.00; 4.00). Also, the bias in goal-setting of these students (Mdn = 4.00) was significantly greater than the bias in goal-setting of students who did not show wishful thinking (Mdn = 0.80), U = 0.00, z = -2.75, p = .001, r = 0.56[5]. These results confirm our hypothesis.

3.7 Students' References When Making Self-Assessments and Setting Goals

We explored whether students referred to their previous performances when making a self-assessment or when setting a goal. Our analyses showed that only 4 out of 24 students (16.66%) mentioned their previous performances as reasons for making a certain self-assessment, but 11 out of 24 students (45.83%) did so for setting a certain goal. Similarly, we explored whether students referred to their wishes when asked to give a reason for making a certain self-assessment or for setting a certain goal. None of the students did so for self-assessments, but 8 out of 24 students (33.33%) referred to their wishes when setting a goal.

[5] The effect size estimate r is calculated as r = Z/SQRT(N), in which Z is the z-standardized Mann-Withney U statistic and N is the number of participants. A value of r greater than .5 is considered a large effect (cf. Field, 2009, p.550).

4. Discussion

Our aim in this study was to examine two potential reasons for inaccurate self-assessments and unrealistic goal-setting among older elementary school students in a realistic school context: memory deficits and wishful thinking. In particular, we investigated, if inaccurate memory of previous performances was related to inaccurate self-assessment and unrealistic goal-setting, and if wishful thinking – operationalized as failure to distinguish between self-assessments or goals on the one hand and wishes on the other – was related to overly optimistic self-assessment or goal-setting. Additionally, we explored if students consciously referred to their previous performances or their wishes in the processes of self-assessment or goal-setting. To this end, students worked on a daily reading task for two weeks and were interviewed twice during this time.

4.1 The Missing Relationship Between Memory Accuracy and Accuracy in Self-Assessment and Goal-Setting

We found no relationship between memory accuracy and accuracy in self-assessment or goal-setting. As a group, the students were generally fairly accurate in their self-assessments and fairly realistic in their goal setting, but at the individual level, they varied considerably in amount and direction of inaccurate self-assessments and unrealistic goal setting. The students were, as a group, also fairly good at remembering their previous performances, but in this case, the variation between students was much smaller. Roughly 70% of the students correctly remembered their previous performances in the self-assessment interview, and even in the goal setting interview, which took place after the weekend, roughly 45% of the students correctly remembered their performances in the previous week. From a methodical perspective, the small variation in the memory accuracy measure may explain the fact that we found no relationship between memory accuracy and accuracy in self-assessment or goal-setting.

From an educational perspective, another aspect is more interesting: Our data show that fourth-graders are generally able to remember their performances well, even over longer periods of time in their everyday school life. Theoretically the students have this information at their disposal when making performance predictions and setting goals in similar tasks. In the interview, however, less than 20% of the students reported to use this information for self-assessments and only about half of the students reported to use this information for goal-setting. The fact that many students do not use the information available to them could also explain the missing relationship between memory of previous performances on the one hand and accuracy of self-assessments and goals on the other.

Our results support an assumption by Visé and Schneider (2000) who suspected an information usage deficit rather than a memory deficit after finding that younger children remembered their performance well immediately after the task but still showed inaccurate self-assessments. The usage deficit might be due to several reasons: It is possible that 10-year old students are simply not aware of the fact that their knowledge of previous performances is useful for self-assessment and goal-setting. Another explanation is that they do have this knowledge but fail to put it to use in daily life at school. Finally, the information usage deficit in our study might also be explained by the fact that the ten reading texts were on different topics so that the students might have underestimated the relevance of their previous performances for the next tasks. This interpretation is in line with experimental research with preschoolers showing that they use performance information to predict performance in identical, but not in similar tasks (Lipko-Speed, 2013).

4.2 The Role of Wishful Thinking

The case for wishful thinking is slightly different: We could not confirm a relationship between wishful thinking (sensu Stipek, 1984, Dweck, 2002) and inaccurate self-assessment, as only one student failed to make the distinction between self-assessments and wishes and we therefore did not formally examine whether wishful thinkers differed in the accuracy in self-assessment from their peers. The fact that almost all fourth-graders in our sample distinguished between self-assessments and wishes could point to a developmental trend. Third-graders in Visé and Schneider's (2000) experimental study showed this distinction only in one of four tasks, and an additional analysis of our own data showed that the one student who showed wishful thinking with regard to self-assessment in our sample was the third youngest student in the sample (9y; 11m). However, Visé and Schneider (2000) used a between-subject design, so an additional explanation might be that our within-subject design was better suited to detect the distinctions the students made. Our first cautious conclusion from our data is therefore that wishful thinking might not be a major problem for fourth-graders when they are asked to make self-assessments in the form of performance predictions, but we suggest replicating this finding in another sample and with a variety of school-relevant tasks.

For goal-setting, wishful thinking was in fact related to inaccurate goal-setting: The three students who did not distinguish between wishes and goals set overly optimistic goals for themselves, and they did so to a greater extent than their peers. It is conceivable that wishful thinking with regard to goal-setting also diminishes with age and that it is therefore still present among the younger, but not among the older students in our sample. We explored this notion in an additional analysis and found no age differences (U = 15,00, z = -1.38, p = .20) between the three wishful thinkers (*Mdn = 10y; 9m)* and the other students in our sample (*Mdn* = 10y; 4m). As there were only three students who showed wishful thinking with regard to goal-setting in our sample, we suggest replicating this finding in a larger sample.

From a practical point of view, it is encouraging that almost all the fourth-graders in our sample were able to distinguish between wishes on the one hand and self-assessments and goals on the other. Our quantitative data suggest that it is slightly harder for students to distinguish between wishes and goals than between wishes and self-assessments. This is supported by the fact that in the interviews none of the students reported to refer to their wishes when making self-assessments, but one third of the students reported to incorporate their wishes in their goal-setting. We interpret these data as a sign that many fourth-graders in our sample already understood a major theoretical difference between self-assessments and goals, namely that goals implicate a person's wish to do something (cf. Locke & Latham, 1990) and self-assessments do not. When introducing goal-setting to older elementary school students, it seems therefore advisable to ensure that all students understood this difference between self-assessments and goals, and then discuss similarities and differences between (pure) wishes and goals in more detail.

4.3 Limitations and Future Directions

Finally, we would like to discuss limitations of the current study and suggest future research directions. First, we would like to address the relatively small sample size of 24 students. Given organizational and economic restrictions, we chose to implement – at the expense of sample size – a complex study design that combined daily tasks over a period of two weeks during regular instruction hours with one-on-one interviews at very specific points in time during this period. A disadvantage of small sample sizes is that they entail the risk of overlooking small effects due to low statistical power.

In fact, we found no relationships between accuracy in self-assessment and goal-setting on the one hand and accuracy in the memory of previous performances on the other. That this result can be plausibly explained by the good and homogeneous memory performance of students in our sample alleviates the concern of having overlooked an existing effect. Another risk of small sample is that rare events might not occur, and in fact, wishful thinking regarding self-assessment was such a rare occurrence in our sample that we could not formally test its relationship with self-assessment accuracy. Interestingly enough we did find a relationship between wishful thinking and goal-setting although wishful thinking with regard to goal-setting was also a relatively rare occurrence.

Second, we would like to discuss our measure of wishful thinking in which students are classified as wishful thinkers if they do not differ between self-assessment and goals on the one hand and wishful thinking on the other. A theoretical drawback of this measure is that students who are actually capable of identifying all 10 main ideas correctly would be falsely labeled as wishful thinkers (cf. footnotes 1 and 2). Although this situation did not occur in our data set, our recommendation for future studies is to use tasks with a larger number of possibly attainable points and to make sure that the maximum number is (objectively) out of the students' reach.

The third limitation concerns our measure of memory of previous performance. Students in our sample remembered their previous performances well, even though the recall occurred after days filled with other activities. When generalizing this finding to everyday situation at school, one must take into account the following two aspects: First, students actively counted their correctly identified main ideas and then recorded the resulting number in their reading booklets. Thus, the encoding of the information to be recalled later might have been more elaborate than in other performance situations in ordinary school life. Second, being part of a study was a special situation for the students in our sample, and the research assistant was present both at the time of encoding and of recall, thereby creating a similar situation for encoding and recall. Both aspects have probably helped the recall (Baddeley, Eysenck, & Anderson, 2015) of previous performances, which means that memory and recall of other performances during ordinary school life might be less accurate.

As fourth limitation, we would like to mention the fact that we did not examine inaccurate (or missing) self-assessment as possible reason for unrealistic goal-setting, even though we mentioned this possibility when reviewing the theoretical background. In the current study, we asked students to set weekly goals first, and only thereafter we asked them to give task-specific self-assessments. This design allowed us to study potential reasons for unrealistic goal-setting without interference that would have resulted from prompting students for a self-assessment first. However, we plan to examine the influence of inaccurate or missing self-assessment on goal-setting in more detail in future research.

Finally, we would like to suggest an idea for future research that goes beyond the considerations we just discussed. In the current study, we examined reasons for inaccurate self-assessments and unrealistic goals because accurate self-assessments and realistic goals are – as explained in the introduction – beneficial to subsequent steps in the learning process and the learning outcome. However, the questions of just how accurate self-assessments and how realistic goals have to be in order to be beneficial stills remain to be answered (cf. Cleary, 2009; Pajares, 1996). We suggest handling these questions not as isolated questions, but to examine them in combination with the quality of other SRL processes, preferably over a longer period. It is conceivable, for example, that the range for the acceptable accuracy of initial self-assessment and goal-setting is broader if students monitor the learning process very closely and are willing to adjust self-assessments, goals, and learning behavior during the learning process if necessary.

In sum, the current study contributes to the literature on self-assessment and goal-setting in the context of self-regulated learning from a developmental and educational perspective. Our suggestions for application in educational settings as well as for future studies support efforts that help students optimize their learning behavior.

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