UNIVERSITY OF LISBON
FACULTY OF PSYCHOLOGY

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PROMOTING SELF-REGULATED LEARNING IN TECHNOLOGY ENHANCED LEARNING ENVIRONMENTS: KEEPING A DIGITAL TRACK OF THE LEARNING PROCESS

PAULA ALEXANDRA NUNES DA COSTA FERREIRA

DOCTORATE IN PSYCHOLOGY
(EDUCATIONAL PSYCHOLOGY)

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Thesis supervised by Professor Doctor Ana Margarida Veiga Simão, Professor Doctor Adelina Lopes da Silva and Professor Doctor Bernhard Schmitz in co-tutelle, submitted in fulfillment of the requirements for the degree of Doctor of Psychology, specializing in Educational Psychology.

2014

To my family for their undoubted love and support.

The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.”

Robert Frost

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Declaration

In accordance with article 41º of the Post-graduate Regulation of the University of Lisbon, approved by the Deliberation of the Rectory nº 1506/2006, this dissertation includes scientific articles that have been submitted for publication to indexed international journals, in collaboration with other authors. The author declares that she is responsible for gathering the data, analyzing and interpreting the results, as well as writing submitting and revising the manuscripts of the articles presented for publication.

Paula Alexandra Nunes da Costa Ferreira

Lisbon, July, 2014

Summary

Learning autonomously and in a meaningful way is a challenge faced by students and teachers daily in all different types of learning environments. In an attempt to aid students during their learning process, teachers and researchers have made strong efforts to study and implement contemporary methodologies and pedagogical resources that will fit the differential needs of students. Thus, it has become increasingly imperative that academicians and practitioners work towards revising and updating ways of learning and teaching as regulation processes within new learning spaces where Self-regulated Learning (SRL) competencies may be developed. This investigation specifically, focused on understanding and providing insights on how learning could be meaningful and rewarding for students through the regulation of learning in contemporary learning environments. Thus, this investigation aimed to understand how students can learn and regulate their learning individually and collaboratively in a computer-supported learning environment. It also aimed to understand how diary tasks and digital traces could capture the learning processes and perceptions associated to the regulation of learning.

The processes involved in the regulation of learning have been widely studied in the field of educational psychology with regards to the impact they have in terms of reflectiveness, motivational/affective aspects and performance outcomes. Nonetheless, the difficulty in measuring these processes in specific contexts has challenged researchers to develop instruments and methods that achieve this purpose. In an attempt to contribute to the already known methods and tools, we also intend to present measures and methods that were used in this investigation to capture the complexity of the regulation of learning. In order to do so, we designed three studies that would allow us to understand the regulation of learning from the students and teachers' perspectives, as well as with objective measures.

In a first phase, we proposed to study students' perspectives of themselves as students by studying what they understand about how they think and function in the classroom. Considering some of the literature has indicated that students aged nine to eleven often experience difficulties in reporting their metacognitive functioning, we decided to examine whether students this age overrated their functioning as students under learning situations. Hence, we firstly present a preliminary approach of how metacognitive awareness (MA) could be measured in students of this age group. Thus, the first study aimed to understand how students (*n* =1029) reported their metacognitive functioning. In a first analysis, Exploratory Factor Analyses revealed a unidimensional structure of the Children's Awareness Tool of Metacognition for Metacognitive Awareness (MA), enclosing metacognitive knowledge (MK) and metacognitive skills (MS) in a single dimension. Then, an analysis with the Item Response Theory approach was conducted to better understand the unidimensionality of the dimension proposed through the interactions between participants and items. With good item reliability (.87), good person reliability (.87) and good Cronbach's α for MA (.95), these results showed the potential of the instrument, as well as a tendency of students aged nine to eleven to overrate their metacognitive functioning. Therefore, we concluded that these students' reflections about how they function in the classroom were not accurate, as has been suggested in the literature with students in similar age groups from different populations (i.e. Lipko-Speed, 2013). In line with these conclusions, we proceeded to develop a second study that would focus on helping students become more reflective about how they learn.

In a second phase, we proposed to investigate how changes could occur towards deep reflection and how students could learn about how they learn with training in how to regulate one´s learning. Accordingly, we examined whether students improved how they learned while they reflected and learned about how they learned. Nonetheless, and as we have previously mentioned, the processes and perceptions of students' SRL are not easily measured. Hence,

we intended to study ways in which these processes and perceptions of SRL could be investigated and assessed. Specifically, the second study aimed to assess whether training in how to regulate one's learning is related to students' growth patterns regarding their reported self-regulated learning activity. This study also investigates whether this type of training has an impact on students' reflective ability. To reach these goals we examine whether students' use of a diary task - developed by interviewing primary school students (*n* = 43) and validated with exploratory (*n* = 78) and confirmatory (*n* = 83) factor analyses - captures change in students' reported self-regulated learning activity and reflective ability during training in how to regulate one's learning (students: *n* = 100; diary task entries: *n* = 1000). Results from Multilevel Linear Modeling revealed a different growth over time of reported self-regulated learning activity between students who experienced training in how to regulate one's learning and students who did not. Moreover, pre and posttest results revealed that the students who experienced the training reported their reflections more autonomously and specifically in their diary task and had better academic performance than students who did not. These results demonstrate how the diary task captured change in students' perceptions, validating it as a monitoring tool. These findings were in accordance with what the literature suggests about learners that regulate their learning. That is, students who are cognitively, metacognitively and motivationally active participants in their learning process, tend to regulate their learning and perform better in tasks (e.g. Wolters, Pintrich & Karabenick, 2003; Zimmerman & Martinez Pons, 1986). Thus, the students that participated in this second study revealed that they were motivated during this learning experience and that they were given opportunities to engage in learning with some degree of freedom.

In a third phase, we studied how contemporary learning environments could support changes in reflections about learning in a meaningful way for students and how the latter learn in and from their social environment. Concurrently, we examined whether students

improved how they learned while they reflected and learned about how they learned in these contemporary learning environments. Hence, in the third study presented, we specifically aimed to understand whether training in how to regulate one's learning had an impact on students' reported self-regulated learning activity and reflections in a computer-supported collaborative learning environment (CSCL). We also examined if this impact was somehow different from other learning environments, such as training in regulated learning without technology and lessons without training in regulated learning. Furthermore, in this study we investigated whether there were differences in academic performance between students in the different learning environments. In order to do so, a quasi-experimental design with repeated measures was used with one experimental group and two control-groups with process diary data and pre and posttests. A total of 44 elementary school students (diary task entries = 440) studying English as a foreign language participated in this study. Through Multilevel Linear Analysis of the diary data the results showed that there was a difference in growth over time of reported self-regulated learning activity between the students who experienced the training in a CSCL environment and the students who did not. What's more, pre and posttest results demonstrated that the students experiencing training in how to regulate one's learning reported their reflections more specifically and autonomously. Ultimately, the students that had the training, had a greater improvement in oral performance and independently of the technology, gained more vocabulary.

Overall, our results provide important information and examples as to how guiding students in the regulation of learning can have positive implications in terms of motivational and metacognitive aspects, as well as academic performance in contemporary learning environments. Hence, providing students with instruments and meaningful environments, where they can engage individually and collaboratively in tasks with the use of technology, can help them become more reflective and strategic in managing their learning process.

Further implications for theory and practice, as well as suggestions for future research are discussed in each of the studies and well as in the general discussion.

Key-words: Self-regulated Learning, Metacognitive Awareness, Computer-supported Collaborative Learning Environments, Multilevel Analysis

Resumo

Os processos envolvidos na regulação da aprendizagem têm sido amplamente estudados em Psicologia da Educação, nomeadamente no que diz respeito ao impacto que estes processos exercem sobre a reflexão metacognitiva, os aspetos motivacionais e afetivos, e o desempenho do aluno. Na prática, o desenvolvimento de uma aprendizagem autónoma e significativa apresenta um desafio diário para alunos e professores em diferentes tipos de ambientes de aprendizagem. De igual forma, a dificuldade em medir os processos de aprendizagem em contextos específicos, tem constituído um desafio para investigadores no sentido de desenvolverem instrumentos e métodos que permitam captar estes mesmo processos. Nas últimas décadas, tanto investigadores como professores têm desenvolvido um esforço colaborativo para implementar e investigar metodologias inovadoras e recursos pedagógicos que respondam às necessidades diferenciadas dos alunos de forma a ajudá-los a melhorar o seu processo de aprendizagem. Neste âmbito, torna-se cada vez mais indispensável o trabalho conjunto de académicos e profissionais quanto à revisão e atualização de métodos de ensino e de aprendizagem que permitam desenvolver as competências da aprendizagem autorregulada em espaços de aprendizagem contemporâneos.

Esta investigação em particular, visa compreender e proporcionar exemplos sobre a forma como o processo de aprendizagem pode ser significativo para os alunos através da regulação da aprendizagem em ambientes apoiados pela tecnologia. Especificamente, o presente estudo tem como principal objetivo compreender como os alunos podem aprender e regular a sua aprendizagem individual e colaborativamente em ambientes de aprendizagem apoiados pela tecnologia. Esta investigação também apresenta como um dos seus principais objetivos compreender como a utilização de diários pode promover a reflexão e, em conjunto com o registo de traços digitais, pode captar os processos de aprendizagem e as perceções

associadas à regulação da aprendizagem. Numa tentativa de contribuir para os métodos e ferramentas já existentes, esta investigação visa ainda apresentar medidas e métodos que foram utilizados para captar a complexidade da regulação da aprendizagem. De forma a concretizar estes objetivos, são apresentados três estudos que permitem compreender as perspetivas dos alunos e dos professores sobre a regulação da aprendizagem através de medidas quantitativas e qualitativas.

Num primeiro estudo, optou-se por investigar as perspetivas dos alunos do quarto ano do Ensino Básico relativamente ao seu papel enquanto estudantes e à forma como refletem e funcionam em contexto de sala de aula. Considerando que a literatura indica que os alunos entre os nove e os onze anos de idade têm alguma dificuldade em relatar o seu funcionamento metacognitivo, analisou-se se estes alunos subestimam o seu funcionamento em diversas situações de aprendizagem. Por isso, e em primeiro lugar, apresentou-se uma abordagem preliminar de como o funcionamento metacognitivo pode ser medida em alunos desta faixa etária. Assim, o primeiro objetivo do primeiro estudo apresentado nesta investigação (n = 1029) foi o de compreender como os alunos relatam o seu funcionamento metacognitivo. Uma primeira análise fatorial exploratória revelou uma estrutura unidimensional do instrumento CATOM (Children's Awareness Tool Of Metacognition) para o funcionamento metacognitivo, colocando o conhecimento metacognitivo e as competências metacognitivas numa única dimensão. De seguida, foi feita uma análise de acordo com a Teoria de Resposta ao Item para perceber melhor a unidimensionalidade da dimensão proposta através das interações entre os participantes e os itens da escala. Com bons valores de fiabilidade dos itens (α = .87), dos participantes (α = .87), e do funcionamento metacognitivo enquanto dimensão única do instrumento (α = .95), os resultados revelaram o potencial do instrumento, bem como uma tendência dos alunos nesta faixa etária de subestimarem o seu funcionamento metacognitivo. Desta forma, concluiu-se que as

reflexões dos alunos sobre a forma como refletem e funcionam na sala de aula não foram precisas, como tinha sido sugerido na literatura com alunos de grupos etários semelhantes de diferentes populações (i.e. Lipko-Speed, 2013). Em consonância com estas conclusões, procedeu-se ao desenvolvimento de um segundo estudo onde apresentamos o desenvolvimento de um instrumento e de uma intervenção que permitissem tornar os alunos mais reflexivos sobre a forma como aprendem dentro da sala de aula.

Num segundo estudo, pretendeu-se investigar como a mudança pode ocorrer através da reflexão profunda e como os alunos podem aprender a aprender com treino na regulação da aprendizagem. Assim, optou-se por examinar se os alunos melhoraram a sua aprendizagem ao refletirem e aprenderem sobre a forma como aprendem. No entanto, e como já foi referido, os processos e as perceções dos alunos sobre a aprendizagem autorregulada não são facilmente medidos. Desta forma, pretendeu-se estudar formas através das quais estes processos e perceções da aprendizagem autorregulada poderiam ser medidos. Mais especificamente, neste segundo estudo colocou-se como objetivo principal perceber se o treino da regulação da aprendizagem está relacionado com as trajetórias dos alunos relativamente à sua atividade autorregulada. Neste estudo optou-se igualmente por investigar se este tipo de treino tem algum impacto na capacidade de reflexão dos alunos. Assim, pretendeu-se compreender se o uso de um diário, que foi desenvolvido através de entrevistas com alunos (n = 43) e validados com uma análise fatorial exploratória (n = 78) e confirmatória (n = 83), poderia captar uma mudança nas perceções dos alunos sobre a forma como regulam a sua aprendizagem durante o treino na regulação da aprendizagem (alunos: n = 100; registos de diário: n = 1000). Através de uma Análise Multinível Linear para medidas repetidas, os resultados revelaram que o treino na regulação da aprendizagem influenciou a forma como os alunos relataram a sua atividade autorregulatória no diário ao longo das aulas. Estes resultados evidenciam que o diário

captou as mudanças nas perceções dos alunos, apresentando-o assim como uma ferramenta com potencial para a reflexão monitorização dos processos de aprendizagem. Verificou-se ainda que os alunos que tiveram treino registaram as suas reflexões de forma mais específica e autónoma do que os alunos dos grupos de controlo 1 e 2, e tiveram um melhor desempenho académico. Estes resultados estão de acordo com o que a literatura sugere sobre os alunos autorregulados. Ou seja, os estudantes que estão cognitiva, metacognitiva e motivacionalmente ativos no seu processo de aprendizagem, tendem a regular a sua aprendizagem de forma mais eficaz e têm melhor desempenho académico (i.e., Wolters, Pintrich & Karabenick, 2003; Zimmerman & Martinez-Pons, 1986). Por fim, os alunos que participaram neste segundo estudo revelaram que estiveram motivados durante a intervenção essencialmente porque lhes foram dadas oportunidades de se envolverem na sua própria aprendizagem com algum grau de liberdade.

Num terceiro estudo, pretendeu-se estudar como os ambientes de aprendizagem contemporâneos podem fomentar mudanças nas reflexões sobre a aprendizagem de uma forma significativa para os alunos e como estes podem aprender no e com o seu ambiente social circundante. Concomitantemente, propôs-se examinar se os alunos melhoraram a forma como aprenderam ao refletirem e, ao mesmo tempo, perceber se conseguiram aprender a aprender nestes ambientes de aprendizagem contemporâneos. Assim, no terceiro estudo, especificamente, procurou-se compreender se o treino da regulação da aprendizagem teve algum impacto no relato das reflexões feitas pelos alunos e da sua atividade autorregulada num ambiente de aprendizagem colaborativa apoiado pela tecnologia. Procedeu-se também a análise das possíveis diferenças existentes nas perceções de alunos em ambientes de aprendizagem diferentes (i.e., com treino mas sem o apoio da tecnologia e sem treino). Ainda, procedeu-se a uma análise de possíveis diferenças no desempenho académico entre os alunos nos diferentes ambientes de aprendizagem com

e sem treino. Utilizou-se um desenho quasi-experimental com um grupo experimental (com treino e tecnologia) e dois grupos de controlo (com treino mas sem tecnologia e sem treino) e dados provenientes de diários, traços digitais, observações e pré e pós-testes. Um total de 44 (440 diários) alunos do 4º ano do Ensino Básico que estudam Inglês como língua estrangeira, participaram neste estudo. Através de uma Análise Multinível Linear para medidas repetidas dos dados do diário e indicadores de desempenho contínuo, os resultados mostraram que os alunos do grupo experimental relataram a sua atividade de aprendizagem autorregulada de forma diferente dos alunos dos grupos de control 1 e 2. Os resultados dos pré e pós-testes revelaram ainda que os alunos do grupo experimental registaram as suas reflexões de forma mais específica e autónoma do que os alunos dos grupos de controlo 1 e 2. Por fim, os alunos do grupo experimental demonstraram melhor desempenho oral, enquanto todos os alunos que tiveram treino, independentemente da tecnologia, adquiriram mais vocabulário

No geral, os resultados apresentados fornecem informação e exemplos interessantes sobre a forma como os alunos podem regular a sua aprendizagem individual ou colaborativamente em ambientes apoiados pela tecnologia, providenciando implicações positivas para aspetos motivacionais, metacognitivos e de desempenho académico. Assim, concluiu-se que ao proporcionar aos alunos instrumentos e ambientes significativos e contemporâneos, adaptados às suas necessidades individuais e colaborativas, os primeiros podem tornar-se mais reflexivos e estratégicos na gestão do seu processo de aprendizagem. Outras implicações para a teoria e prática, assim como limitações e sugestões para futuras investigações são discutidas nos diferentes estudos apresentados, bem como na discussão geral.

***Palavras-chave*:** Aprendizagem Autorregulada, Metacognição, Ambientes de Aprendizagem Colaborativa Apoiados pela Tecnologia, Análise Multinível

Zusammenfassung

Autonomes und sinnstiftendes Lernen ist eine Herausforderung, mit der Schüler und Lehrkräfte täglich in verschiedensten Lernumgebungen konfrontiert sind. Bei dem Versuch, Schüler während ihres Lernprozesses angepasst an ihre individuellen Bedürfnisse zu unterstützen, haben Lehrkräfte wie auch Forscher große Anstrengungen unternommen, aktuelle Methoden und pädagogische Ressourcen zu untersuchen und einzusetzen. Daher steigt die Notwendigkeit für Forschung und Praxis, Arten des Lernens und Lehrens als Regulationsprozess innerhalb neuer Lernräume zu definieren, in denen Kompetenzen des selbstregulierten Lernens ausgebildet werden können. Die vorliegende Studie versuchte herauszufinden, wie das Lernen für Schüler durch die Regulation ihres Lernens in aktuellen Lernumgebungen sinnstiftend und lohnend sein kann. Das Ziel war es, zu verstehen wie Schüler lernen und wie sie ihr Lernen individuell und gemeinschaftlich in einer Computer-gestützten Lernumgebung regulieren können. Ein weiteres Ziel war es, zu verstehen, wie Tagebuchangaben und digitale Bearbeitungsspuren den eigentlichen Lernprozess sowie das mit der Regulation verbundene Erleben erfassen können.

Bisher wurden in der Pädagogischen Psychologie die in die Regulation des Lernens eingebundenen Prozesse in ihrer Wirkung auf die Reflektion, motivationale/affektive Aspekte und Leistungsergebnisse umfassend untersucht. Die Schwierigkeit, diese Prozesse in spezifischen Kontexten zu messen, hat die Forschung vor die Herausforderung gestellt, kontextspezifische Instrumente und Methoden zu entwickeln. In einem Versuch, zu diesen Instrumenten und Methoden beizutragen, werden die Messinstrumente und Methoden präsentiert, die wir in dieser Untersuchung zur Erfassung der Komplexität der Regulation des Lernens eingesetzt haben. Hierfür entwarfen wir drei Studien, die uns ermöglichen

sollen, die Regulation des Lernens zum einen aus der Perspektive der Schüler sowie der Lehrkräfte und zum anderen anhand objektiver Messinstrumente zu verstehen.

In einer ersten Phase wurde die Perspektive der Schüler auf sich selbst als Lernende untersucht, indem wir ihr Verständnis davon erfassten, wie sie im Unterricht denken und funktionieren. In Anbetracht dessen, dass es in der Literatur Hinweise darauf gibt, dass Schüler im Alter von neun bis elf Jahren oft Schwierigkeiten haben, ihre metakognitive Vorgehensweise zu berichten, entschieden wir uns zu untersuchen, ob Schüler diesen Alters ihren Strategieeinsatz überbewerten. Wir beschäftigen uns daher zunächst damit, die metakognitive Bewusstheit (MA: metacognitive awareness) bei Schülern dieser Altersgruppe zu erfassen. Hierfür untersuchten wir in der ersten Studie, wie Schüler ihr metakognitives Vorgehen berichten. In einer ersten Analyse zeigte eine exploratorische Faktoranalyse eine eindimensionale Struktur des Children's Awareness Tool of Metacognition for Metacognitive Awareness (MA), welche zum einen das metakognitive Wissen (MK: metacognitive knowledge) und zum andern die metakognitiven Fähigkeiten (MS: metacognitive skills) vereint. Danach wurde anhand der Item Response Theory versucht, diese Eindimensionalität des Instruments durch die Untersuchung der Interaktionen zwischen Versuchspersonen und Items besser zu verstehen. Mit einer guten Item-Reliabilität (.87), guter Personen-Reliabilität (.87) und einem guten Cronbach's α für MA (.95) zeigten diese Ergebnisse das Potenzial des Instruments auf. Gleichzeitig wird auch die Tendenz der Schüler im Alter von neun bis elf Jahren deutlich, ihren Einsatz metakognitiver Strategien zu überschätzen. Wir schließen daher, dass die Reflektion der Schüler darüber, wie sie im Unterricht vorgehen, ungenau war, wie es auch die Literatur mit Schülern ähnlicher Altersgruppen und verschiedener Populationen bereits gezeigt hat (z.B. Lipko-Speed, 2013). In Einklang mit diesen Schlussfolgerungen gingen wir dazu über, eine zweite Studie

zu entwickeln, die darauf fokussieren sollte, die Reflektion der Schüler über das Lernen zu fördern.

In einer zweiten Phase versuchten wir herauszufinden, wie Veränderungen in Richtung tiefergehender Reflektion von statten gehen und wie Schüler durch ein SRL-Training, das Lernen erlernen können. Dementsprechend untersuchten wir, ob sich ihr Lernen durch Reflektion und Training verbesserte. Da es jedoch, wie oben bereits erwähnt, nicht einfach ist, den Prozess und das wahrgenommene SRL der Schüler zu messen, strebten wir auch an, weitere Möglichkeiten zu erkunden, diese zu erfassen. Ziel der zweiten Studie war es zum einen zu untersuchen, ob ein SRL-Training in Zusammenhang mit der Steigerung der selbstregulierten Lernaktivität steht und ob das Training einen Einfluss auf die reflektiven Fähigkeiten der Schüler hat. Um diese Ziele zu erreichen, untersuchten wir, ob die Nutzung eines Tagebuchs – entwickelt anhand von Interviews mit Grundschülern (n = 43) und validiert durch explorative (n = 78) und konfirmatorische (n = 83) Faktorenanalysen – Veränderungen in den berichteten und auch den tatsächlichen Aktivitäten des SRL bewirkt (Vpn: n = 100; Tagebucheinträge: n = 1.000). Mehrebenenanalytische Ergebnisse zeigten unterschiedliche Wachstumskurven für die selbstberichteten Aktivitäten des SRL für Schüler der Trainingsgruppe und der Vergleichsgruppe. Zusätzlich zeigte sich im Prä- und Posttest, dass Schüler der Trainingsgruppe ihre Reflektionen selbstständiger und spezifischer in ihrem Tagebuch berichteten und bessere schulische Leistungen erzielten als Schüler der Vergleichsgruppe. In Einklang mit der bisherigen Forschung zeigen diese Ergebnisse, dass das Tagebuch die Veränderung im Erleben der Schüler erfassen konnte und validieren es damit als Monitoring-Instrument. Das bedeutet, dass Schüler, die kognitiv, metakognitiv und motivational aktiv an ihrem Lernprozess partizipieren, dazu neigen ihr Lernen zu regulieren und besser bei Aufgaben abzuschneiden (i.e. Wolters, Pintrich & Karabenick, 2003; Zimmerman & Martinez Pons, 1986). Somit zeigten die Schüler, die an der zweiten Studie

teilnahmen, dass sie während dieser Lernerfahrung motiviert waren und die ihnen angebotenen Freiheitsgrade nutzten.

In einer dritten Phase untersuchten wir, wie computergestützte Lernumgebungen die Reflektionen der Schüler über das Lernen auf sinnstiftende Weise verändern können und wie diese in und von ihrem sozialen Umfeld lernen. Gleichzeitig untersuchten wir, ob Schüler ihr Lernen verbessern, während sie in diesen Lernumgebungen reflektieren und das Lernen lernen. Daher untersuchten wir in der dritten Studie, ob ein SRL-Training einen Einfluss hat auf die von den Schülern berichteten Aktivitäten des SRL und ihre Reflektionen in einer computergestützen, gemeinschaftlich genutzten Lernumgebung (CSCL: computer-supported collaborative learning environment). Wir untersuchten auch, ob dieser Einfluss sich von anderen Lernumgebungen unterschied, d.h. von nicht-computergestützten Trainings und Unterricht ohne SRL-Training. Weiterhin erforschten wir in dieser Studie, ob es einen Zusammenhang zwischen der Leistung der Schüler in der Trainingsgruppe (mit CSCL) und den von ihnen berichteten Aktivitäten des SRL gab. Wir untersuchten auch, ob es zwischen Schülern unterschiedlicher Versuchsgruppen einen Unterschied in der schulischen Leistung gab. Um dies zu realisieren, nutzen wir ein quasi-experimentelles Design mit Messwiederholung mit einer Experimental- und zwei Kontrollgruppen sowie einer prozessualen Messung mittels Lerntagebuch und einer longitudinalen Messung mittels Prä- und Posttests. Insgesamt nahmen 44 Grundschüler (Tagebucheinträge: n = 440) mit Englisch als Fremdsprache an der Studie teil. Die lineare Mehrebenenanalyse der Tagebuchdaten ergab einen Unterschied in den Wachstumskurven der berichteten Aktivitäten des SRL zwischen den Schülern der Versuchsgruppe (CSCS) und der Kontrollgruppen. Die Tagebuchdaten zeigten auch, dass diese berichtete Aktivität in Zusammenhang mit der täglichen Leistung stand. Darüber hinaus zeigten die Ergebnisse des Prä- und Posttests, dass Schüler, die das Training erhielten, ihre Reflektionen spezifischer und selbstständiger

berichteten. Weiterhin zeigten die Schüler der Experimentalgruppe eine Verbesserung ihrer mündlichen Leistung und lernten, unabhängig von der eingesetzten Technologie, mehr Vokabeln.

Insgesamt liefern unsere Ergebnisse wichtige Informationen und Beispiele, wie das Heranführen der Schüler an die Regulation des Lernens positive Auswirkungen auf motivationale und metakognitive Aspekte, aber auch auf die schulische Leistung in heutigen Lernumgebungen haben kann. Daher kann es Schülern helfen, sie an Instrumente und sinnstiftende Lernumgebungen heranzuführen, in denen sie sich individuell wie auch gemeinschaftlich unter Gebrauch von Technologie bewegen können, um reflektierter und strategischer im Management ihres Lernprozesses zu werden. Weitere Implikationen für die Theorie und die Praxis sowie Vorschläge für zukünftige Forschung werden in jeder Studie wie auch in der Gesamtdiskussion besprochen.

*Schlüsselw**örter:*** Selbstgesteuertes Lernen, Metakognitives Bewusstsein, Computergestützte kollaborative Lernumgebungen, , Multilevel-Analyse

General Index

List of Tables

List of Figures

List of Abbreviations

ToM - Theory of Mind

MA - Metacognitive Awareness

MK - Metacognitive Knowledge

MS - Metacognitive Skills

MASRL - Metacognitive and Affective Model of Self-regulated Learning

IRT - Item Response Theory

EFL - English as a Foreign Language

CATOM - Children's Awareness Tool of Metacognition

DOGSRL - Diary of Guided Self-regulated Learning

CSCL - Computer-supported Collaborative Learning

INTRODUCTION

> "They want a choice in their education, in terms of what they learn, when they learn it, where, and how. They want their education to be relevant to the real world, the one they live in. They want it to be interesting, even fun."
>
> (Tapscott, 2008, p.126)

Theoretical Framework and Conceptualization

How can we make learning meaningful for students? This was the question my English didactics professor asked the class when I was taking my professionalization degree in teaching English Language and Literature in 2001. She stressed the importance of knowing our students, their motivations to learn, perceptions of learning and emotional processes as they learned. Otherwise, teaching would fall short of providing students with meaningful and personalized learning environments and experiences. I learned a great deal from this professor on how to be a teacher that could adopt and adapt instructional methods to meet the learning needs of students. My motivation to learn how to teach better, led me towards doing research in Educational Psychology. More specifically, with respect to understanding how students could learn English better and be more motivated to learn it in contexts that were meaningful for them. Hence, I invested in studying how students could regulate their learning in order to achieve their goals in English class and be motivated while doing so.

In the same year, Boekaerts' EARLI presidential address (published later in 2002a) touched upon important aspects regarding changes that could be made and investigated with respect to the strengths and weaknesses of the Self-regulated Learning approach. The author mentioned how it was crucial for research to consider the structure of the classroom in order to understand the interaction processes that took place between students, their peers,

their teacher and the learning tasks and resources. Furthermore, she posited that in traditional classrooms there was little room for self-regulated learning considering students were cognitively, emotionally, and socially reliant on their teachers. In these traditional environments teachers tend to structure the learning goals themselves, decide on which type of interaction students are allowed to have and do not adapt the learning environment to their students. Moreover, Boekaerts reinforced that researchers and teachers should focus on powerful learning environments, where students are given the opportunity to generate their own learning goals, allowing them to experience meaningfulness within their learning context. In addition, how students self-regulate their learning should be considered also in relation to their socio-emotional goals. That is, if they are encouraged to solve problems in collaborative learning settings, then they are most likely to develop important learning strategies because firstly, because they must attribute value to the task at hand by following their own goal structure, and secondly, they must attribute meaning to the learning context, which implies interpersonal behavior, social support and demands. In sum, the author defended that teachers ought to allow their students to reflect on, practice and receive feedback on their self-regulation of learning and that researchers must study this process in context, taking into account the possible multitude of social interactions. I viewed myself in Boekaerts' words and remembered what my professor had taught me about understanding our students, their motivations to learn and perceptions of learning.

Later, I came across Zimmerman's 2008 paper, where he put into perspective how self-regulated learning and motivation could be investigated in terms of future prospects. The author presented important developments made by other researchers (i.e. Greene &

Azevedo, 2007) involving the measurement of self-regulated learning and motivational feelings and beliefs through innovative methods in authentic contexts. These methods involved think-aloud protocols (Azevedo & Cromley, 2004), direct observation (Perry, Vandekamp, Mercer, & Nordby, 2002), diary tasks (Schmitz & Wiese, 2006) and computer traces (Winne & Jamieson-Noel, 2002). Thus, Zimmerman posited how research regarding these methods was still in its initial phase. Furthermore, he stated that research needed to focus on different domain areas in order to investigate the processes of self-regulated learning with enhanced state-of-the-art assessment measures. The studies presented in Zimmerman's paper (2008) and the recommendations made for future research influenced the aim of this investigation, how it was designed and how the regulation of learning was measured. Accordingly, this investigation aimed to provide insights on how the processes involved in the regulation of learning could be observed and encouraged in contemporary academic contexts in order to provide young students with tools for life-long meaningful learning.

The structure of this investigation includes this general introductory section where we present the general questions; a section including the theoretical framework and conceptualization of the studies; a section on the general methodological approach; the three studies included in the investigation; and a general discussion section. In the section on the theoretical framework and conceptualization of the studies, we present theoretical concerns regarding children's overall awareness of learning. Specifically, we discuss developmental aspects of how children understand mental states and cognitive activities, involving the perceptions and beliefs they have about themselves as students and about proposed learning

tasks, and involving metacognitive awareness of how they function in class. Thus, this first section is a starting point for the subsequent sections.

Then, the theoretical framework presented positions itself within a social cognitive perspective of learning, founding a basis for the constitution of the general aims of this investigation. We primarily aim to demonstrate that children can learn and regulate their learning individually or collaborative in their surrounding physical and social environment according to their learning goals by providing them with opportunities to make choices. We also aim to show how using diary tasks can be beneficial for capturing motivational processes and perceptions involved in the regulation of learning in contemporary learning environments supported by technology.

Hence, within this framework, we present core selected works and discuss recent developments in the literature that will allow us to introduce three studies that fulfill the general aims of this investigation (presented above). What's more, with the findings from these three studies, we propose to answer the general questions of this investigation which are linked to the general aims and which include: (1) How can learning be meaningful for students? (2) What do children understand about how they think and function in the classroom?; (3) How can changes occur towards deep reflection?; (4) How can students learn about how they learn?; (5) How can students improve how they learn?; (6) How can contemporary learning environments support these changes in a meaningful way for students? and (7) How can these changes be examined over time? Within these general questions, we include more specific questions in each section that guide our discussion between the three studies presented (see figure 1 for conceptual map of the investigation).

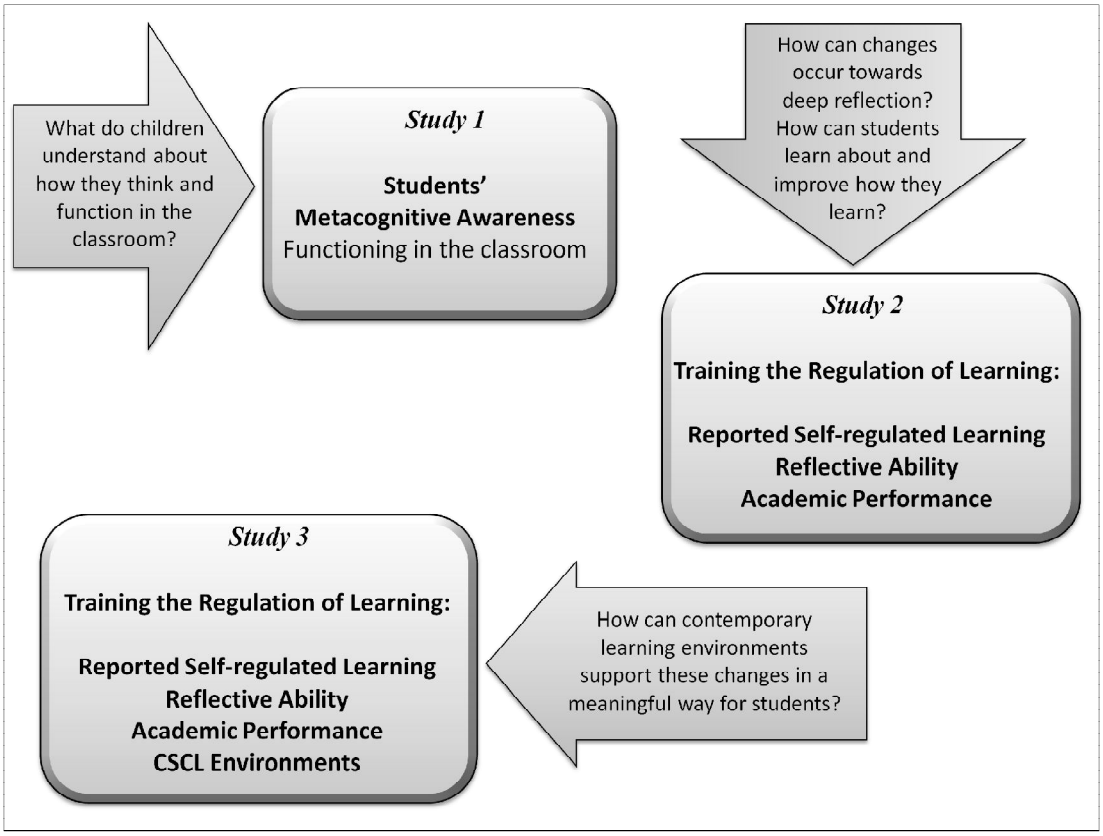


Figure 1. Conceptual Map of the Investigation

We feel that by answering these questions, this investigation contributes to the area of self-regulated learning because as we present in the three studies later, we were able to examine how students viewed themselves as learners and were able to regulate their learning individually and collaboratively by establishing goals, anticipating learning outcomes, monitoring and evaluating their learning process in a contemporary learning environment. Furthermore, as we will specify in the methodological options section of the introduction, we used quantitative and qualitative process data from a classroom context with self-report and objective measures, which allowed us to capture key changes in the students' perceptions and learning experiences. Lastly, we also feel that this investigation contributes to area of self-regulated learning because we chose to work with children in English as a Foreign Language (EFL) classes, which have both been understudied (sample and domain) in the

self-regulated learning literature, as we will show further on in this introduction. What's more, EFL has been a compulsory discipline in primary education in Portugal and only in 2014 has it become mandatory, implying that much work is needed in investigating teaching practices and learning processes. This These issues will also be considered in the general discussion section.

Children's awareness of Mind and Learning

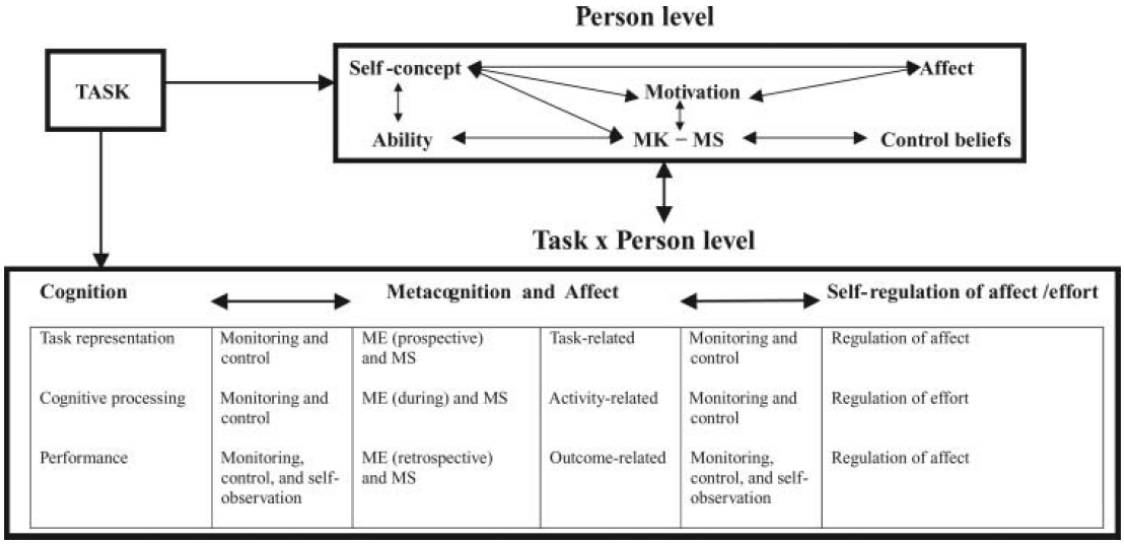
It is between early childhood and adolescence that children develop from an elementary understanding of mental states to various assets of cognitive activities, including memory, attention and inference, and later, to epistemological reflection about human knowledge. This knowledge regarding the existence of the mind, its dimensions (e.g. beliefs and intentions), as well as the skill to use this knowledge to predict and explain human behavior, can be considered as Theory of Mind -ToM (Premack & Woodruff, 1978). Children's ToM may affect how they behave and act in their social environment, interpret and make inferences about others' conduct, and how they develop cognitively, communicatively and emotionally (Hughes & Leekman, 2004; Lalonde & Chandler, 1995). According to the literature, these aspects of children's conceptual knowledge of cognitive activities are not a succession of distinctive developmental stages (Pillow, 2012). In fact, they can occur simultaneously and even influence each other, since each has a gradual, extended and dynamic development (Ronfard & Harris, 2014). Nonetheless, a general developmental path can be examined in the research literature.

Evidence has shown that young children (aged two to three and even younger) have some awareness of their own mental state, including emotions and beliefs (Onishi & Baillargeon, 2005; Woodward, 2009), that increases as they get older (aged four), as well as the visual perspective and recognition of others' knowledge or false beliefs (Bartsch & Wellman, 1995; Dennett, 1978; Dunn, 1999; Flavell, Shipstead, & Croft, 1978; Moll & Tomasello, 2006). Between the ages of three to four, children have some understanding of goals and intentions (Shultz & Wells, 1985) and between the ages of five to seven, they seem to understand the causal role of intentions (Astington, 1993; Bello et al., 2014), as well as of beliefs (Flavell & Miller, 1998). Although knowledge about mental functioning is systematized during these early years, a more mature organization of knowledge regarding mental activities emerges in children during their late childhood years (nine to ten years of age). Various types of epistemological thought are manifested in early adolescence (thirteen to fourteen years of age) and continue to develop throughout the later years, although there may be a considerable amount of individual differences concerning epistemologies (Pillow, 2012). Thus, the literature suggests that children's understanding of mental functioning (e.g. beliefs, emotions, etc...) presents a basis for further epistemological development (Kuhn, 2000; O'Brien et al., 2011). Barzilai and Zohar (2014) stated that epistemic thinking is multifaceted and includes both cognitive and metacognitive features.

Flavell (2002) argued that ToM and metacognition are conceptually related (although they have been studied separately) because they are both centered on activities that entail thinking about thinking or the development of cognitions about cognitions. In other words, both are centered on the study of individuals' knowledge and cognitive development about

what goes on in their minds (ToM also focuses on children's awareness of others) as they learn and develop. Specifically, metacognition is considered a multidimensional construct and has been defined as thinking about thinking or, the awareness and management of an individual's own cognitive processes/products (Flavell & Ross, 1981; Kuhn & Dean, 2004; Schraw, 1998).

Some authors put forth several dimensions of metacognition, such as metacognitive knowledge, metacognitive processes and metacognitive experiences (Flavell, 1979; Flavell, Miller, & Miller, 2002; Vanderswalmen, Vrijders, & Desoete, 2010). The first has been described as an individual's awareness and profound understanding of cognitive processes and products, while the second has been described as the individual's capacity to monitor and self-regulate cognitive activities during learning, and the third as the experiences in which the individual is engaged in consciously and affectively in order to meet any determined intellectual challenge. Recently, Efklides (2011) distinguished between these three dimensions in the Metacognitive and Affective Model of Self-regulated Learning (MASRL). The author refers to metacognitive knowledge as the beliefs, declarative knowledge, theories about goals, strategies and cognitive functions of an individual; to metacognitive skills as procedural knowledge and strategies, including planning, self-monitoring and evaluating; and to metacognitive experiences as overt processes of cognitive monitoring during learning activities (see Figure 2).



(Adapted from Efklides, 2011)

Figure 2. The MASRL model. *Note.* ME = metacognitive experiences; MK = metacognitive knowledge; MS = metacognitive skills.

Contemporary literature has shown evidence that metacognition can emerge from early on (Balcomb & Gerken, 2008). For instance, some studies found evidence of different forms of metacognitive knowledge and monitoring skills in children as young as three through observational methods in naturalistic settings (Demetriou & Whitebread, 2008) and using non-verbal tasks (Balcomb & Gerken, 2008). Similar to the literature on ToM, several studies on metacognition refer that metacognitive abilities develop with age (Kuhn & Dean, 2004; Schneider, 2008). Furthermore, some authors mention that by the ages of eight to ten, children are inclusively able to use metacognitive processes consistently and maturely (Bares, 2011). Nonetheless, it is important to note that some authors emphasize that metacognition does not develop simply because the individual ages (Sperling, Howard, Miller, & Murphy, 2002). Rather, other aspects, such as social aspects, prior knowledge, and context must be considered. Roebers, Krebs and Roderer (2014) for example, found in children aged nine to eleven, age-related structural associations between monitoring, control and test performance with a positive effect of high confidence on test performance, but with a negative effect on appropriate control behavior and test achievement.

In the studies presented in this investigation, we focused on children aged nine to eleven, who according to the literature, already have some knowledge about their mental functioning, but who still need to develop that knowledge further. Some authors have suggested that children's understanding of mental functioning (e.g. beliefs, emotions, cognitions etc...) is crucial because it presents a basis for further epistemological development (Kuhn, 2000; O'Brien et al., 2011). Accordingly, Winne (2011) stated that the metacognitive knowledge students choose to use when working (which may constitute a belief, be tactical or factual), is a threshold of the approach they use to learn.

Hence, the first study presented focuses on children's perceptions of their metacognitive awareness and how the latter can be measured. Accordingly, we centered this first study within the framework of metacognition presented in this first section, namely Efklides' MASRL model. In general, we wanted to study what children understand about how they think and function in the classroom. Specifically, we contextualized this study in EFL classes to understand whether students' metacognitive awareness was accurate. In consonance, and considering most of the existing self-report measures that assess metacognitive aspects were developed for older students (i.e. The Awareness of Independent Learning Inventory by Elshout-Mohr, Meijer, van Daalen-Kapteijns, & Meeus, 2004; and The Metacognitive Awareness Inventory by Schraw & Dennison, 1994), we also presented a new instrument in the first study that could measure metacognitive awareness in children aged nine to eleven.

In order to examine children's metacognitive awareness, we decided to use Item Response Theory (IRT) because it permitted us to examine their performance, as well as the instruments' on a common scale (De-Mars, 2010; Embretson, 1996). This statistical methodology aided us in interpreting whether the children overrated or underrated their metacognitive awareness and whether the instrument was valid for this purpose. In fact, the

results from this first study indicated that students aged nine to eleven overrated their metacognitive awareness, leading us to conclude that they need guidance in their knowledge of how they think and function as students in order to better regulate their learning in class. As Efklides (2011) indicated in her work, metacognition is of crucial importance to the self-regulation of learning. Soderstrom and Rhodes (2014) specifically mentioned how minimizing metacognitive inaccuracy optimizes self-regulated learning.

Providing students with tools that could serve as monitoring and self-reflection guides could be an important step because these tools could offer students feedback about how they think and function as they learn. Metacognitive and self-regulation guidance could also be provided by developing interventions and new learning environments that could promote the regulation of learning. As Barzilai and Zohar (2014) mentioned, learning environments and procedures that promote the active construction of metacognitive knowledge (i.e. computerized evaluation prompts) can provide better long-term effects in students than other methods based on knowledge transmission. The conclusions from our study, as well as the findings from these other studies led us to develop the remaining two studies presented in this investigation and that focus specifically on the regulation of learning in meaningful learning environments that promote collaboration and that in some cases (i.e. study three), are sustained by multimedia study.

The Regulation of Learning from a Social Cognitive Perspective

In the 1930's, Vygotsky proposed that reasoning emerged in children through practical activity in a social environment. He stated that the development of reasoning was influenced by general cognitive processes, as well as cultural practices and language. Hence, Vygostky (1986) argued that speech is social when it originates and that it only becomes internalized verbal thought as children develop. Language has various functions, such as regulation,

which is external, and it is through language that adults are able to regulate children's behavior. The author presented language as an external tool that is used for social interaction. Accordingly, children use this tool (as thinking out loud or self-thought) to guide personal behavior. While in an initial phase self-talk is a tool used for social interaction, it is gradually used more as a tool to self-directed and self-regulate behavior. With neurological maturation, which enables proximity between cognitive and linguistic functions, language is internalized and rationalized. This internal language has various functions, one of which is to regulate behavior following social learning. Hence, once language is internalized, children use it to regulate their own behavior.

Contemporary theory on self-regulated learning has developed with a strong basis on the important work of several scholars, such as Vygotsky. The work of these scholars inspired some of the ideas behind this investigation in different ways. For instance, in 1989 Bandura theorized that self-regulation entails the reciprocal influence of the environment on the person, which is mediated through behavior. In agreement with Bandura's theory, Zimmerman defined self-regulated learning as the level of active metacognitive, motivational and behavioral participation students have in their own learning process (Zimmerman, 1989). Boekaerts (2002a) extended Zimmerman's definition of self-regulated learning and defined it as the attempts made by students to achieve personal goals by generating thoughts, feelings and actions while performing tasks in their surrounding environment. Corno (2001) explained how the self-regulated learning approach reinforces metacognitive reasoning by increasing students' self-awareness and responsiveness, which in turn, strengthens individual receptiveness and interpretation of new information. Rosário and Almeida (2005) described this approach as an important aid for students' cognitive development and metacognitive reasoning, as well as a distinct methodology able to guide students in understanding themselves and their work step by step, so as to become autonomous in their actions and

relations. Lopes da Silva, Veiga Simão and Sá (2004) posited that applying self-regulation to academic settings implies teaching students to understand and use personal resources, and guiding them in their learning processes with the cultural means and available resources in a more competent, efficient and motivated manner. Thus, we decided that we wanted to position our work within a theoretical framework which considered the self and environmental factors during the regulation of learning.

Also, recently in a meta-analysis of 48 studies, Dignath, Buettner and Langfeldt (2008) considered both metacognition and motivation as key components of self-regulated learning across different domain areas. The authors found large effects on students' overall academic achievement when they experienced self-regulated learning interventions focusing on both metacognitive strategies and motivational regulation. The authors also found that the studies reported different strategy use on the students' behalf, depending on the domain area task, indicating that each domain area is different in the strategic and motivational way in which students approach it. These findings also helped us decide on whether we would center our research on a single domain-area, as was our initial idea, or whether we would study self-regulated learning transversally to all areas. As the Dignath and colleagues stated, students approached the different domain areas differently. Hence, we confirmed the idea of working with EFL students and centered our studies on only this domain area, which allowed us to examine specific motivational aspects and strategy use during the regulation of learning in this particular area. In the case of our studies, as mentioned in the introductory note, EFL was a domain area already familiar to the researchers. According to Larkin (2010), metacognitive awareness is fundamental when learning EFL because various parts of language such as nouns, verbs, adjectives, semantics and syntax are examples of metalinguistic knowledge, which is a form of metacognitive knowledge. Students tend to have this knowledge in varying degrees while it develops over time through practice.

Underdeveloped metacognitive awareness may lead students to having difficulties in terms of decoding and interpreting written and oral language, and in terms of choosing the adequate strategies to overcome obstacles.

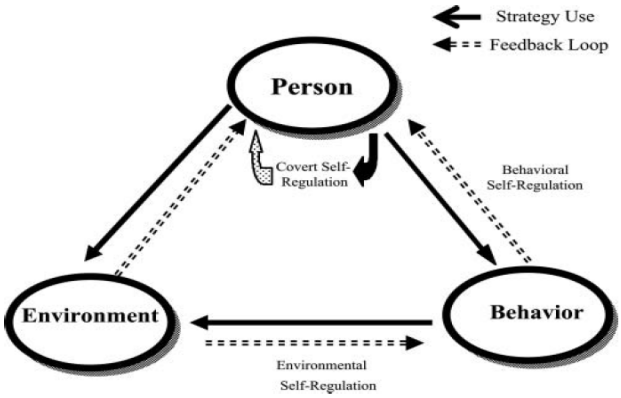
In consonance, Efklides (2011) stated that self-regulated learning encompasses learning processes where metacognitive, motivational and affective aspects are in constant interaction. These findings, as well as Wolters' (2003) distinction between the regulation of cognition and the regulation of motivation, led us to consider both metacognition and motivation as central aspects of the regulation of learning in the development of the training and instruments presented in this investigation. To summarize, Wolters posited that cognitive regulation (metacognition) can be distinguished from motivational regulation in terms of purpose and target. That is, the regulation of cognition has an impact on both students' use of cognitive learning strategies and the way they perceive experiences; whereas motivational regulation influences students' eagerness to handle information, make sense of that information and persist in the task (Boekaerts, 1997). The regulation of cognition influences how students go forth when completing an activity, while motivational regulation affects the reasons why students accomplish it. These strong arguments led us to search for a theoretical model that considered these important aspects of self-regulated learning and where we could base most of our research on.

In the studies presented in this investigation, we focused mainly on Albert Bandura's (2006) work regarding human agency and the social aspects of learning, and Barry Zimmerman's contributions to the theory on self-regulated learning with his Triadic Social Cognitive Model (1989) and Cyclical Phase Model of Self-regulated Learning (2000). In this section, we briefly discuss this theoretical framework that was behind the development of the second study presented.

Bandura (1977) stated that human functioning is the dynamic interaction between person, behavior, and environment. The person variables consist of the self-processes that interact with the environment through actions. Furthermore, Bandura theorized that the person is simultaneously a producer and a product of social systems and is differentiated between direct individual agency (intentional influence over one's own life); proxy agency, entailing others to act on the individual's behalf in order to achieve desired goals; and collective agency, which is experienced through socially coordinated and interdependent effort and collective efficacy (Bandura, 2001). The author also characterized four properties of human agency (Bandura, 2006), namely, intentionality (i.e. formed intentions that contain action plans and strategies to accomplish those plans), forethought (i.e. set goals and anticipations of probable outcomes of future actions to direct and motivate efforts), self-reactiveness (i.e. self-regulation of thoughts and actions, connecting the former to the latter) and self-reflectiveness (i.e. metacognitive reflection and self-exam of own thoughts, goals and actions to pursue those goals).

Zimmerman's triadic Social Cognitive Model and Cyclical Phase Model of Self-regulated Learning were influenced by Bandura's Social Cognitive Theory model of causation. While Bandura's model involves a triadic reciprocal determinism of behavior, personal factors (i.e. cognition) and environmental influences that function as interacting determinants that have a bidirectional influence on each other at varying levels (Bandura, 1989b), Zimmerman's models were centered specifically on the learning process in academic contexts and emerged as a challenge to stage explanations of children's development (Zimmerman, 2000; 2013). Furthermore, also concurrently with Bandura's Social Cognitive Theory, Zimmerman proposed a triadic Social Cognitive Model of Self-regulated Learning involving strategies and feedback processes. To be precise, the author explained how feedback from personal, behavioral and environmental processes allows students to adapt to

changes in their own thoughts and feelings, overt behavior and surrounding social environment. Hence, he presented three forms of self-regulated learning that are interdependent through feedback loops. Specifically, he proposed covert, behavioral and environmental forms of self-regulated learning. While the first refers to the observation and adaptation of thoughts and feelings to perform and learn better, the second involves self-observation and strategic adaptation of performance, and the third includes monitoring and control of changing environmental circumstances (see figure 3).



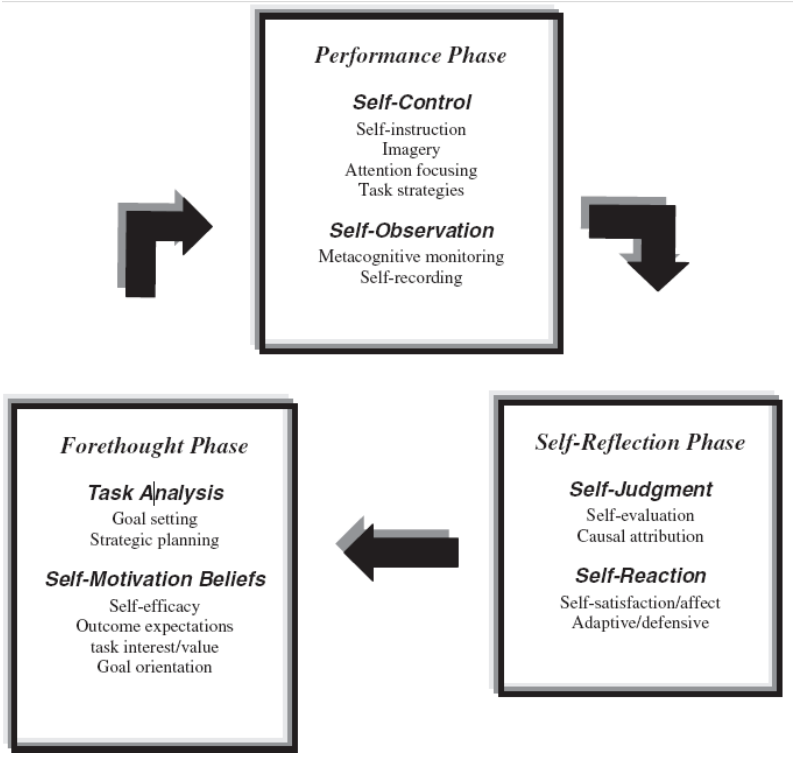
(Adapted from Zimmerman, 2013)

Figure 3. Social Cognitive Model of Self-regulated Learning.

Along with Martinez-Pons in a study conducted in 1986, Zimmerman found fifteen categories of strategies that are related to the three forms of self-regulated learning presented in the Social Cognitive Model. These categories included covert strategies (i.e. setting goals and planning, organizing and transforming instructional material, seeking information, rehearsing and memorizing), behavioral strategies (i.e. keeping and reviewing records, monitoring and self-evaluation) and environmental strategies (i.e. environmental structuring, seeking social assistance and self-consequences). According to the literature on learning EFL, self-regulated learning strategies are intricately connected with language learning because they will determine students' performance in the foreign language in many ways (i.e. Larkin, 2010; Sadeghy & Mansouri, 2014). In fact, Tabatabaei and Hoseini (2014)

found that students learning EFL preferred social strategies and benefitted in terms of performance from affective, social and memory strategies.

So as to integrate the motivational and metacognitive aspects of self-regulated learning, Zimmerman (2000) proposed a Cyclical Phase Model of Self-regulated Learning. Through this model, the author explained how students' motivational beliefs and learning processes are associated to three regulation phases, namely, forethought, performance and self-reflection. Although some of these phases have the same denomination as Bandura's proposed properties of human agency, they pertain to similar processes of the student when in front of a learning task/assignment to do specifically. In this model, the forethought phase involves task analysis and self-motivational beliefs, where students can set goals, plan their use of strategies, control effect, value tasks and direct performance with the aid of self-efficacy beliefs and outcome expectancy. The performance phase entails self-control, where students can use self-instruction techniques, use imagery and task strategies, structure their learning environment, seek help and focus their attention on the task. Still in the performance phase, students may turn to self-observation mechanisms, such as metacognitive monitoring and self-recording of their own learning process. Lastly, the self-reflection phase includes self-judgments, where students self-evaluate the effectiveness of their learning performance and attribute causality regarding the outcomes. The self-reflection phase also involves different self-reactions, such as self-satisfaction and adaptive/defensive inferences about how the learning process was conducted (i.e. the need to maintain or change a certain strategy) in order to proceed to the next learning challenge. These phases and corresponding processes are cyclical and influence each other mutually (see figure 4).



(Adapted from Zimmerman, 2008)

Figure 4. Cyclical Phase Model of Self-regulated Learning.

As we mentioned in the first section of this introduction, we found in the first study that students (aged 9 to 11) overrated their metacognitive awareness. These results directed us towards the remaining research questions of this investigation and thus, the more specific research questions of the second study presented. Since we had examined that children's accuracy in rating how they think and function as they learn could improve, we wanted to understand how changes could occur towards deep reflection, how children could learn about how they learn, and how they could improve how they learn. In order to answer these general research questions, we developed study two specifically within the theoretical conceptualization of human functioning presented by Bandura and self-regulated learning put forth by Zimmerman. In this second study, we discussed how in fact training in how to regulate one's learning and using a diary task that follows contemporary microanalytic assessment protocol guidelines (Cleary, 2011), could be an important approach to measure students' reflective thinking (Schmitz, 2006). The training in how to regulate one's learning

was designed according to Zimmerman's models of self-regulated learning (presented above) in order to develop conscious and skillful use of self-regulated learning strategies during regular EFL classes, and attending to students' learning goals by providing them with opportunities to make choices. As training sessions progressed, students were explicitly introduced to processes and strategies involved in how to regulate learning and were able to choose from learning activities to do in order to learn. As for the diary task, and considering there is a considerable amount of literature that encourages the use of this type of tool in academic settings (Aregu, 2013; Belski & Belski, 2014; Schmitz & Perels, 2011), we designed it according to Bandura's core properties of human agency, as well as Zimmerman's Cyclical Phase Model of Self-regulated Learning (mentioned above). In sum, we wanted to provide students with an instrument that would allow them to learn about how they learn by reflecting deeply on their intentions to learn, their anticipations of learning performance and outcomes, and their self-regulated learning activity (including motivational aspects), allowing them to self-examine their course of learning from thoughts to actions. Additionally, this study investigated whether the training designed to promote the regulation of learning had an impact on students' academic performance.

With these objectives in mind, we proposed to understand first whether training in how to regulate one's learning was related to students' growth patterns regarding their reported self-regulated learning activity. (i.e. whether they liked to plan, whether they felt able to monitor their learning, etc...). Secondly, we inquired whether this type of training would have an impact on students' reflective ability. (i.e. intentions to learn, anticipations of learning outcomes and self-examination). Thirdly, we examined whether the students who experienced the training in how to regulate one's learning had better academic performance than students who did not. Ultimately, with these propositions, we wanted to understand if

students could improve and enjoy how they learned by regulating their learning and by using a diary task for reflective thinking about their course of action.

The findings of this second study confirmed what is mentioned in the literature about students who intentionally self-regulate their learning. That is, the students in the experimental group revealed to be cognitively, metacognitively, motivationally, and behaviorally active managers of their learning process by reporting their growth of self-regulated learning activity over time differently and their reflections more autonomously and specifically than the control group, as well as by having better academic performance than the students who did not experience the training (Bandura, 2006; Wolters, Pintrich, & Karabenick, 2003; Zimmerman, 2013).

The results from this second study led us to raise other research questions that were discussed in study three and four of this investigation. Specifically, if using diaries and experiencing training in how to regulate one's learning could improve young students' awareness of how they regulated their learning in EFL class, then how could contemporary learning environments support this learning? Furthermore, how did/could students collaboratively learn within their social environment? Lastly, how could changes occurring during the learning process be examined over time? In order to answer these questions, we decided to examine self-regulated learning within the framework of Computer-Supported Collaborative Learning Environments (CSCL), which we discuss in the following section.

Computer Supported Collaborative Learning Environments

Research on technologies that support collaborative learning is a rapid growing area of interest. Recent literature has focused on how using technology can meet the needs of contemporary learners within collaborative learning environments (Kam & Katerattanakul, 2014). Some studies have focused specifically on enhancing the use of learning strategies

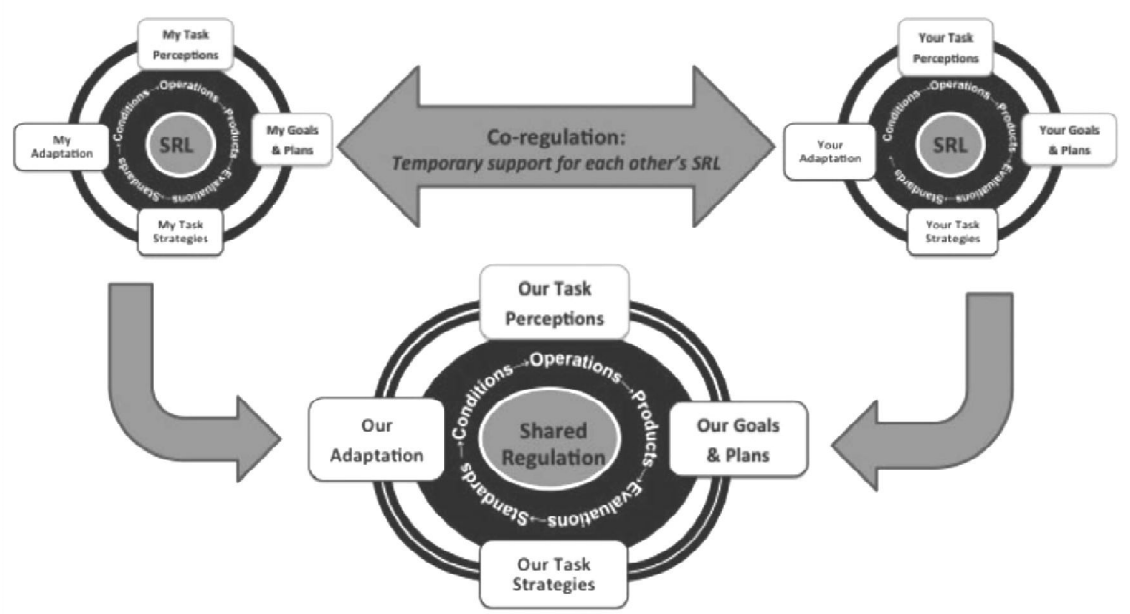
(i.e. metacognitive) through a constructive learning approach with technological tools that provide storytelling and modeling (Fridin, 2014; Psycharis, Botsari, Mantas, & Loukeris, 2014). Others have specifically highlighted the design aspects of CSCL environments that support shared goals, discussions regarding goals, interactions between collaborators and achievement outcomes, and that affect motivational/emotional factors and teacher feedback (Coll, Rochera, & Gispert, 2014; Druin et al., 2003; Mayer & Estrella, 2014). Still, others focused specifically on language learners' competencies and the importance of regulating learning individually and collaboratively in computer-supported learning environments (Chang, 2005). Thus, positive effects of the technological tools were found in students' learning processes and motivations to learn in all of these studies.

Some authors have theorized about the regulation of learning with an emphasis on collaborative processes, such as Järvela and Hadwin (2013). We focused on these authors' work because they made a clear distinction between different types of the regulation of learning within collaborative learning environments. Firstly, the authors argued that self-regulated learning can influence collaboration between students because it is intentional, goal directed, metacognitive, it involves regulating motivations/emotions, behavior and cognition, and ultimately, it is social. Similar to Bandura and Zimmerman, Järvela and Hadwin posited that there is a strong relation between the regulation of learning and the social context. Furthermore, these authors claimed that collaborative learning is coconstruction through shared goals, strategies, metacognitive and motivational monitoring and task representations.

The authors touched on Bandura's differentiation of direct individual agency, proxy agency and collective agency, when they proposed that the regulation of learning can be self-, co- and/or shared. In order to distinguish between the three types of regulated learning, the Järvela and Hadwin focused on three focal points, namely on whose goals are being contemplated, on who is regulating and on what is being regulated. In line with Bandura's

Social Cognitive Theory and with Zimmerman's Social Cognitive Model, Järvela and Hadwin mentioned that self-regulated learning takes place when students perform learning tasks alone and when they work collaboratively on complex tasks. In sum, in order for collaborative work to be successful, the members of a group must be able to regulate their own beliefs, cognitive processes and actions (Winne, Hadwin, & Perry, 2013). Co-regulation takes place when the regulation of learning of the members of a group is guided, sustained or restricted by others. That is, the group members know about each others' goals and performance and help each other monitor and regulate activity through questioning and prompting. Lastly, Järvela and Hadwin mentioned shared regulated learning as the third type of regulation for successful collaborative learning. Shared regulated learning occurs when a group regulates collectively in the coconstruction of shared beliefs, goals, task perceptions, monitoring perceptions and evaluation through shared performance to achieve shared outcomes.

Järvela and Hadwin (2013) posited that whether or not students learn successfully in CSCL environments depends on which self-regulated learning competencies and strategies they bring to their group (self-regulated learning). Furthermore, successful learning in these environments also depends much on the reciprocal support students provide each other so as to foster self-regulated learning competence within their group (co-regulated learning). Ultimately, students can be successful in CSCL environments if they engage in collective regulation of learning (shared regulated learning), by sharing the regulation of motivation and adequate coordination of strategies (see figure 5).



(Adapted from Järvela & Hadwin, 2013)

Figure 5. Three forms of regulated learning in successful collaboration (self-regulated, co-regulated, and shared regulation of learning).

In the last study presented in this investigation, we studied whether a contemporary learning environment, such as a CSCL environment, supported students' regulation of learning, whether the latter were able to learn within their social environment and lastly, how these changes occurred over time. With this study, we wanted to understand whether the impact of training in how to regulate one's learning on students' reported self-regulated learning activity and reflective ability in CSCL was different from other learning environments (i.e. a control group with training in how to regulate learning in a collaborative learning environment with no computer support and a waiting control group with no training). In order to study these variables with possible similar or contrasting scores, we used the diary task that was presented/tested in study two of this investigation. Accordingly, we examined if there were differences in overall academic performance between students in the different learning environments. The results from this study allowed us to conclude that there were differences between the experimental and control groups in terms of how they reported their self-regulated learning activity over time, and that the students studying in the CSCL environment

reported their reflections more specifically and autonomously, and had better oral performance than students who learned in other environments. However, we found that regardless of the technology support, the students with the training performed better in a vocabulary task than the students with no training. Our findings were in accordance with the literature on the regulation of learning and collaboration in CSCL environments, suggesting that the students of both groups working in collaboration with training in how to regulate their learning reported their reflections more autonomously and specifically and hence, revealed more metacognitive awareness of their functioning in class (Fridin, 2014; Järvela, Järvenoja, & Malmberg, 2012; Sanchez-Villalon, Ortega, & Sanchez-Villalon, 2010).

Methodological Approach

At the beginning of the last century, Vygotsky criticized Static Tests primarily because they were not culture fair and did not assess subjects' learning capacity (Karpov, 2005). Since then, alternative methods to Static Testing have been investigated so that both the test variables and the instructions given to subjects were considered (Sternberg & Grigorenko, 2002). We used a mediated assessment approach to apply the instruments used in this investigation, which is at the center of Feuerstein, Jensen, Rand, Kaniel and Tzuriel's (1988) approach to Dynamic Assessment and which has been previously used with children in other studies (Lin, 2010). According to these authors, this type of assessment refers to an interactional process between adults and children, where the first interfere with the way in which the second view the world, either by explaining and/or modifying the order and/or context of a set of stimuli in order to generate curiosity in regards to these stimuli. Feuerstein (1990) proposed that an evaluator should identify the students' problems and provide the necessary mediation during a learning phase. The concept of Mediated Learning Experience (MLE) tackles specific concerns, such as the evaluator's sensitivity to students' questions and

responses, the transfer of principles beyond the task at hand, and the mediation of meaning of the assessment context. An assessment situation qualifies as a mediated dynamic assessment, only if all these criteria are met (Kozulin & Garb, 2004).

Feuerstein and colleagues (1988) suggested three main characteristics of MLE, including intentionality and reciprocity, meaning and transcendence, which we focused on, as in other studies (Tzuriel, & Shamir, 2002). Essentially, the MLE principle of intentionality and reciprocity refers to the mediator's intentional efforts to arouse a state of observance in students in order to register specific information, as well as the students' awareness of the affect their reciprocal actions have in order to produce change (Haywood & Tzuriel, 1992). The mediation of meaning, as described by Haywood and Tzuriel (1992) pertains to the interactions where the stimuli displayed have motivational, affective and value-oriented significance. In this case, the mediator does not transmit a neutral posture in relation to the stimuli, but instead, reveals enthusiasm and attributes importance to the stimuli, either verbally or non-verbally. Lastly, the mediation of transcendence concerns the character and the goal of MLE interactions as these authors explain. This mediation is closely related to each individual's needs and the strategies used to meet these needs. This procedure is different from static testing, where the measurement of a child’s response goes without any attempt to intervene in order to guide the child’s comprehension.

This investigation presents three studies with a different design each, but with some common aspects concerning the instruments used and proposed interventions. In methodological terms, our general aim was to move from general assessment methods for larger populations to more specific and process-oriented assessment of small groups with a larger amount of detailed data (see figure 6 for methodological map of the investigation). Consent to conduct the research was requested and granted from the schools, parents and

students. Prior authorization was given by the Portuguese Ministry of Education (see Appendix A).

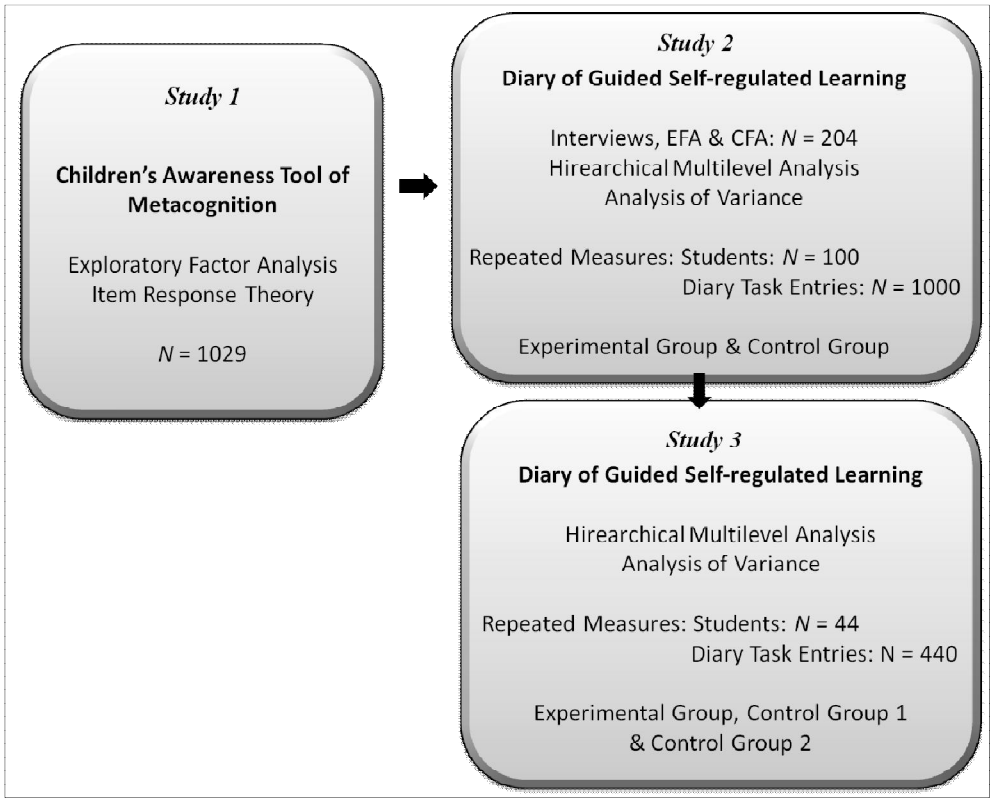


Figure 6. Methodological Map of the investigation

In a first approach and from a metacognitive standpoint, we intended to acquire a general idea of how students aged 9 to 11 viewed how they think and function in EFL class. Thus, our approach was to design an instrument, apply it to a large-scale sample and use quantitative methods to assess it. By having this type of sample (total *n* =1029), we could then generalize our findings to our remaining studies. In particular, in the first study presented (*The unidimensionality and overestimation of metacognitive awareness in children: validating the CATOM*), we used a quantitative approach because our aim was to understand how students reported their metacognitive functioning at a particular point in time. Accordingly, we also aimed to validate the Children's Awareness Tool Of Metacognition (CATOM) as an event measure, hence we performed Exploratory Factor Analysis and IRT to test the

unidimensionality of the instrument, as well as to assess how both the students and the instrument performed in interaction with each other (DeMars, 2010; Embretson, 1996).

In a second approach, we opted to use both a quantitative (i.e. scale-type questions of the diary task, results of vocabulary and oral task) and a qualitative (i.e. open-ended questions included in the diary task) approach to develop a process-oriented measure that would capture students' perceptions regarding their self-regulated learning activity and specific strategy use throughout time. Using process data would allow us to monitor any changes occurring over time and make statistical inferences concerning the results we obtained (Schmitz & Wiese, 2006). Thus, in our second study (*Does training in how to regulate one's learning affect how students report self-regulated learning in diary tasks?*), we aimed to investigate how using a diary task (The Diary of Guided Self-regulated Learning: DOGS-RL) could provide students with an opportunity to reflect and learn about how they learn and capture changes in these students' perceptions (aged 9 to 11) about how they regulated their learning during various lessons in EFL class. As other similar instruments tested in the literature for older students, we proposed that this diary task could capture change in students' perceptions regarding their experiences of planning, monitoring and evaluating work (i.e. Klug, Ogrin, Keller, Ihringer, & Schmitz, 2011).

Hence, our intent was for each student to fill in 12 diary tasks. So as to create and assess the diary task, as well as to understand how students perceived their functioning in class, we used a total sample of 304 students. We found this number of participants appropriate because, although our main aim was not to generalize our findings, we wanted to get a better understanding of how this type of instrument could be interpreted and used by students of this age. We used exploratory and confirmatory factor analyses to determine the diary task's structure initially, and then, multilevel linear modeling, which allowed us to understand the effects of the training in how to regulate learning throughout time (Glogger,

Schwonke, Holzapfel, Nuckles, & Renkl,, 2012). As we mentioned previously, the training we used in this study was developed according to Zimmerman's models of self-regulated learning. In order to study the effects of the training, we used a quasi-experimental control-group design with repeated measurements (with pre and posttest) with process data gathered in a real life context, as recommended in the literature (Klug et al., 2011). Out of the 304 students, 100 participated in this part of the study (40 in the experimental group and 60 in the control group).

The approach we used on our third study (*Training the regulation of learning in CSCL environments and the impact on students' learning reports and performance*) was also based on quantitative (i..e. scale-type items of the diary) and qualitative (i.e. observations) assessment methods and data. We used a quasi-experimental design with one experimental group with 12 training sessions (the first two were introductory sessions) on how to regulate learning in a CSCL environment using an adapted version of the Moodle platform (n = 14) and two control-groups (control group 1 with 16 students with training on how to regulate learning in a collaborative learning environment, but with no computer support; and control group 2 with 14 students with no training) with process diary task data and pre and posttests gathered in an authentic context. The first control group would enable us to control general training aspects, as well as any Hawthorne effects (Schmitz & Wiese, 2006). That is, it would allow us to control any students' reactions in terms of improvements or modifications of their behavior, but that are due to the fact that they are being studied and not because they are being experimentally manipulated. By introducing control group 2, we would be able to study whether the training (with and without computer support) had any kind of impact on the students' learning development in terms of self-regulation and task improvement. We feel that this investigation also contributes to the literature in terms of its methodological approach because it reports quantitative and qualitative findings from varying groups in a classroom

context (i.e. experimental group, control group 1, control group 2), providing us with a high level of ecological validity, as suggested in the literature (Schmitz & Wiese, 2006). As in study two, we used the DOGS-RL and multilevel linear modeling, which enabled us to understand the effects of training in regulated learning on students' perceptions of how they self-regulated their learning throughout time. We also used ANOVA for repeated measures with the pre and posttest measures to help us determine the differences and/or similarities between the three groups.

By using the methodological approach in study three, which allowed us to examine changes over time (i.e. multilevel analysis, diary entries), we hoped we would be able to understand whether students were able to improve how they learned, whether and how they learned within their social environment, whether this contemporary learning environment (i.e. CSCL) supported any changes in students' regulation of learning, and ultimately, if this learning experience was meaningful for students.

CHAPTER I

The unidimensionality and overestimation of metacognitive awareness in children: validating the CATOM

Introductory Note

> "Education is the most powerful weapon which you can use to change the world."
>
> Nelson Mandela

The first study presented in this investigation provides an understanding of what children understand about how they think and function in the classroom. Specifically, it aims to clarify whether children have a precise awareness of their metacognitive functioning when they are engaged in academic tasks. This first study created a basis and set the context for the other studies presented in the following chapters because it allowed us to identify a degree of precision in children's metacognitive awareness. In particular, children revealed an overestimation of how they think and function in class. This allowed us to understand that creating instruments and providing them with meaningful environments where they could strategically reflect on and intentionally regulate their learning process, could potentially be beneficial for them.

The unidimensionality and overestimation of metacognitive awareness in children: validating the CATOM[1]

Abstract

Children often have difficulty in reporting their metacognitive functioning, which leads them to frequently overrating themselves under learning situations. Hence, this study presents a preliminary approach of how children's metacognitive awareness (MA) can be measured. Essentially, this study aims to understand how children (*n* =1029) report their metacognitive functioning. In a first analysis, EFA revealed a unidimensional structure of the instrument (MK and MS). IRT was then used to analyse the unidimensionality of the dimension and the interactions between participants and items. Results revealed good item reliability (.87) and person reliability (.87) with excellent Cronbach's *α* for MA (.95). These results show the potential of the instrument, as well as a tendency of children to overrate their metacognitive functioning. Implications for researchers and practitioners are discussed.

Key-words: Metacognition, Metacognitive Knowledge, Metacognitive Skills, Self-regulated Learning, Item Response Theory

[1] Ferreira, P.C., Veiga Simão, A.M., & Lopes da Silva, A. (in press). The unidimensionality and overestimation of metacognitive awareness in children: validating the CATOM. *Anales de Psicologia*.

Introduction

The literature on self-regulation (Pintrich, 2000) considers metacognition as one of its important components because it consists of individuals' knowledge of their own cognitive and affective processes, including their ability to consciously and intentionally monitor and regulate these processes (Hacker, 1998). Flavell (1976) first defined metacognition as active monitoring and subsequent regulation and management of processed information regarding concrete goals or objectives. Later, Efklides (2008) described metacognition as being a "critical component of the self-regulation process because" (p. 283) it includes self-awareness, which in turn, involves past experiences, beliefs and goals, as well as future goals when students think, feel and act in context.

Efklides (2011) distinguishes between three different metacognitive facets in the Metacognitive and Affective Model of Self-regulated Learning (MASRL) which are related to motivational and affective aspects, namely, metacognitive knowledge (MK) and metacognitive skills (MS) at the person level of self-regulated learning, and metacognitive experiences (ME) at the person-task level of self-regulated learning. While MK pertains to beliefs, declarative knowledge, theories about goals, strategies, cognitive functions, tasks and persons (Efklides, 2001), MS encompasses procedural knowledge and strategies, including planning, self-monitoring and evaluating (Veenman & Elshout, 1999). ME are described as being overt processes of cognitive monitoring during the completion of a task (Efklides, 2006). These three facets comprise our operational definition of metacognition in this study.

Beliefs about ability have an impact on how individuals approach a task (Dweck, 1999). That is, the manner with which individuals view their accomplishments and failures influence their approach to new challenges. Hence, if children are to mature in life by reflecting on the decisions they make in their surrounding environments, then we feel that it is essential for

them to develop metacognitive awareness (MA). In order to do so, it is essential that research focus on how MA originates and develops.

The literature (Wigfield, Klauda, & Cambria, 2011) has indicated a lack of both studies and instruments with primary school children regarding metacognitive and motivational aspects of self-regulation. Furthermore, it is still unclear and more empirical evidence is needed on how children acquire MA or specifically, MK, considering it is related to other metacognitive facets, such as MS and ME (Efklides, 2011), which will lead to the development of new MS (Misailidi, 2010). Hence, in an attempt to contribute to the literature on metacognitive functioning, this paper presents a study that proposes an approach of how the person level (MK and MS) of the MASRL model can be measured in fourth-grade children. Specifically, this study aims to understand the accuracy with which young children report their metacognitive functioning. We consider young children from infancy to the age of 11, as indicated by other authors (Larkin, 2010). Therefore, in order to achieve our objective, we chose to use IRT, which would allow us to calibrate our participants and items on a common scale (DeMars, 2010; Embretson, 1996). This type of measurement provides an analysis of the interactions between people and items, which would help us interpret the variables we wanted to measure. Furthermore, the interpretations of items in which participants have a higher probability of dominating, have a greater diagnostic convenience for our study than group-related ratings.

We first present other studies that discuss children's awareness of their metacognitive functioning, as well as the accuracy with which they report it, with the purpose of sustaining our target population. Then, we demonstrate how we developed and tested the CATOM with exploratory factor analysis and the IRT in order to help us better understand how children report their MK and MS.

Evidence of Children's Metacognitive Awareness

Evidence has shown that metacognitive abilities seem to progress with age (Kuhn & Dean, 2004; Schneider, 2008; Schneider & Lockl, 2002; Schraw & Moshman, 1995). Specifically, Schraw and Moshman (1995) proposed that children as young as age 6 develop cognitive knowledge and are able to reflect on their cognition. Around early middle childhood, children seem to gain a considerable understanding of how the mind processes information actively through interpretation and construction and, consolidate these skills between the ages of 8 to10 (e.g. Barquero, Robinson, & Thomas, 2003). What's more, at this age, children realize that perceptual information must be adequate and present in order to produce knowledge (Flavell, 2004). Bares (2011) for instance, suggested that children between the ages of 8 and 10 are able to use metacognitive processes on a consistent and mature basis. With time, children develop their ability to regulate cognition and seem to improve their monitoring and regulation skills by practicing planning between the ages of 10 to 14. Eventually, monitoring and evaluation of cognition may or may not develop with substantial improvements later on in life, along with the construction of metacognitive theories (Schraw & Moshman, 1995).

The literature on metacognition has provided evidence that children in primary school possess not only declarative knowledge regarding their metacognitive functioning, but procedural knowledge as well - MS (Annevirta & Vauras, 2006). Efklides (2011) proposed that metacognition could interact with self-regulation of behavior and motivational aspects at the person level (MK), including learners' beliefs about themselves and the task, and at the

person-task level (ME), when the learner is engaged in the task. Essentially, the author explained how ME affects self-processes and causal attributions by providing feedback about one's self and the task at hand, which ultimately, will affect individuals' awareness of themselves as learners (MK). Essentially, the author presented metacognition as being deliberate and as encompassing various strategies, which are also involved in self-regulation processes - namely, orientation strategies, planning strategies, regulation strategies of cognitive processing, monitoring strategies, evaluation strategies and recap strategies. These strategies may be initially used by children unconsciously, although they gain an awareness of this use with time. Eventually, children learn to use these strategies intentionally in a self-regulated way (Pihlainen-Bednarik & Keinonen, 2010; Schneider & Lockl, 2002).

Thomas and Au Kin Mee (2005) discovered how primary school children were familiar with the names of the strategies they used, how they used them and how they could be beneficial to them while they learned. The authors presented evidence regarding students awareness of the strategies they used due to the development of metacognition. In general, the literature on metacognition has shown that students who are more effective at regulating their cognitive strategy use, also demonstrate more adaptive performance and achievement outcomes (Baker, 1994; Butler & Winne, 1995; Schraw & Moshman, 1995).

Schneider (2008) for instance, investigated the relationship between theory of mind at age 3 and the subsequent development of metamemory at age 5 with 174 children. Essentially, ToM pertains to the “ability to estimate mental states, such as beliefs, desires, or intentions, and to predict other people’s performance based on judgments of their mental states” (p. 115). Schneider theorized that theory of mind enabled young children to acquire

MK and language skills more easily, and argued that developing early ToM competencies could facilitate the development of metamemory later on. Specifically, the results of this study revealed that while MK had a tendency to increase with age, MS were not so evident. We mention ToM in our study because we agree with Flavell (2002) that it encompasses pretty much the same objective as metacognition, which is to study children's knowledge and cognitive development about what goes on in their minds as they learn.

On another note, Burman (1994) cautioned that developmental psychology cannot be considered an absolute scientific doctrine with normative standards by which children must be compared to. In this sense, the author advised that general standardization of children's development through general measuring be avoided because of the complexity surrounding these children's learning and living environments. Furthermore, some evidence has revealed that general metacognition does not inevitably enhance with age. As an example, Sperling and colleagues (2002) measured general metacognitive knowledge and regulation in children from grades 3 to 8 with a validated self-report measure. The authors discovered that younger students had higher metacognition scores than older students. What's more, the authors hypothesized that because the instrument they applied measured general metacognition, that metacognition could possibly be more domain-specific as students become older and attain more expert content knowledge.

Larkin (2010) suggested that engaging young children in experiences which facilitate metacognitive development, encourages learners to be responsible for their own learning and to interact with others in meaningful ways. Furthermore, there is a need to use MK and MS in specific subject areas in the sense that metacognition in transversal, but specific to each

area. The author refered to the instruction of the English language, which specifically includes metalinguistic knowledge, such as various parts of speech (such as nouns, verbs, adjectives etc.), as well as morphological and phonological aspects, and language style and tone. In addition, Larkin explained how over time and with experience and instruction, children are able to develop this specific type of MK, which will allow them to differentiate between particularities of the language, such as letters, sounds and meaning. Later, Kirsch (2012) also focused on metacognition in a language learning context and demonstrated how MK was essential for children learning a foreign language to develop self-regulation, autonomy and proficiency. Similarly, the study we present focuses on children's MA (MK and MS) when learning EFL.

Children's Accuracy in Reporting Metacognitive Awareness

Some of the literature has suggested that young children are less accurate than older children at predicting how well they will be able to learn something (ease of learning judgments), as well as judging how well they have learned something (judgments of learning). These metacognitive judgments are contemplated in the MASRL model proposed by Efklides (2011) and seem to be more accurately produced by children throughout the elementary school years (Schneider, 1998). Some authors have argued (Rizzo, Steinhausen, & Drechsler, 2010) that children in this age group are capable of making accurate and differential judgments of their self-regulation processes and hence, be metacognitively active. Others have posited that both children (from 8 years of age on) and adults are weak at

determining good from bad performance because of their inaccurate confidence judgments (Allwood, Ask, & Granhag, 2005; Allwood, Innes-Ker, & Fredin, 2008).

Flavell, Friedrichs and Hoyt (1970) studied children's prediction accuracy using a performance prediction paradigm. Essentially, the authors asked a sample of nursery school children, kindergarteners, second-grade and fourth-grade students to predict how many pictures (from 0 to 10) they could remember. In order to conduct this task, children were presented with a new picture every new trial. Although the nursery school children and kindergarteners were more overconfident than the second and fourth grade, children, all of the children's predicted memory span was higher than their actual memory span. Similarly, Shin, Bjorklund and Beck (2007) asked kindergarteners, first-graders, and third-graders to predict the numbers of pictures they could remember out of 15 in a supraspan task. As in Flavell et al.'s study (1970), the younger children were more overconfident and overestimated more than the third-graders. Hence, the authors stated that when children think they are better than what they actually are on a specific task, this leads them to having higher levels of motivation to persist on that task, which may result into better performance in comparison with more accurate children. This is consistent with Bandura's theory on self-efficacy (1989c), considering children may benefit from overestimating their performance because they continue to be motivated on a particular task.

Lipko-Speed (2013) found similar results, but mentioned that children's overestimation perseveres even with practice due to the lack of knowledge transfer. In short, the past can predict the future in terms of performance. Furthermore, this constant overestimation may lead to continuous failure in certain tasks when confronted with feedback. This is especially

true if these children believe that the amount of effort they make alone absolutely translates into a successful performance on a task (Stipek & MacIver, 1989). Specifically, if children believe that effort, rather than knowledge regarding their previous performance, is a good indicator of their future performance, than it is probable that they will continue to be overconfident and may not pursue improvements in their performance. Essentially, children may not adjust their behavior in order to enhance task performance and may even avoid asking for help from teachers, colleagues, or parents.

Thus, in light of the theoretical findings and recommendations we have presented in this section, we wanted to develop a new measure and to understand how children view themselves as metacognitively active agents of their learning process in their EFL class. Specifically, we want to know how children report their MA (MK and MS) in EFL and hence propose that (H1) children overrate their MA in EFL classes.

Method

Participants and Learning Context

A total of 1029 students participated in this study. Specifically, our sample consisted of 23 students in the development of the items of the CATOM, 805 students (mean age = 8.85; SD = .70; 50.2% boys) in the exploratory factor analysis (EFA) and 201 students (mean age = 9.37; SD = .52; 50.% boys) in the IRT analysis. All students were in the fourth-grade, had the same level of English according to the Common European Reference for Language Learning (level A1) and were from 9 different schools in the district of Lisbon. The children that

participated in this study were predominantly of Portuguese nationality (86%). Other students were of different origins (i.e., African countries and other European countries).

This study focuses specifically on primary-school children in an EFL learning context. We chose this context because the acquisition of a foreign language is mandatory in most European countries at a primary level. Furthermore, foreign language learning is one of the priority areas for European cooperation in education, along with transversal key competences and lifelong learning strategies, such as self-regulation strategies, which allow individuals to be better prepared for contemporary labour markets (European Commission, 2009). In Portugal, learning EFL is optional, not mandatory, which could compromise students' performance in EFL classes. Hence, we decided to invest in this curriculum area in order to meet the challenges posed by modern learning and working environments.

What's more, time is a variable, which must be considered when students are expected to acquire a foreign language because the capacity to learn it is reduced as children become older (Dixon et al., 2012). Thus, it becomes increasingly difficult to learn a foreign language as a native speaker when children reach their teen years (Johnson & Newport, 1989; Mayberry & Locke, 2003). This is also one of the reasons why we proposed to study this age group (8 to 10 years of age). Furthermore, we chose to work with fourth-grade children because it is a transitional grade in Portugal, where children leave primary school and head towards a different system of education where EFL becomes mandatory and the demands of the discipline increase.

Instruments

Interview protocol. This instrument includes questions that ask students about MK, such as how they view themselves as learners of EFL (what their role was); what they think about their class; what they think about how they do in class; and in which ways they learn,

independently of liking a task or not. In terms of metacognitive skills, students are asked about how they prepare for their tasks; how they search for and organize information; how they correct their work as they do it; how they evaluate their work; and how they feel they learned (in this particular case in an EFL class, in terms of listening, speaking, reading and writing).

CATOM. The implementation approach (or protocol) of this on-line instrument was based on the principals of dynamic assessment and the mediated learning approach (Ahmed & Pollitt, 2010; Tzuriel & Shamir, 2002). It includes 19 items on a 5 point scale from never (1) to always (5). Higher scores reflect students that reported to have a higher level of MA (including items that tap on MK and MS). This instrument included cartoon images of children studying as a means of motivating the students to respond, but not so many as to distract students or influence their responses. The instrument was constructed to be responded with the guidance of a teacher.

English Task. This task was based on the national EFL curriculum content in Portugal and was developed according to 2 EFL teachers' guidelines. The task included 5 different multiple choice items where students had to identify grammar and vocabulary mistakes and choose the correct response.

Procedures

Development of the CATOM. In order to construct the items for the CATOM, we initially interviewed 20 fourth-grade students in an EFL class and asked them questions regarding their MA with an interview protocol. We obtained responses such as " I'm responsible for the work I do"; "I work well when I study a lot"; and "I follow my teacher's instructions before I start a task". We then tested the Facial Validity and Content Validity of the scale with the participation of 3 fourth-grade students (with a digital audio recorder). This procedure included authorized individual think aloud sessions that integrated spontaneous commentaries and suggestions on the students' behalf, as well as simultaneous cognitive interpellation from the researcher conducting these sessions as each student viewed and responded to the questionnaire (i.e. of question and answer: "Put the question in your own words."; "I know if I'm doing a test correctly or not because of how much I studied before."). Subsequently, we had a focus-group reflection about the scale including all of these three students (i.e. of question and answer: “What is the questionnaire for?"; "This questionnaire is for our teachers to know what we think we do in class, before, during and after tasks"). Two primary school teachers responded to an open-ended question questionnaire about the scale (i.e. of question and answer: "What does the questionnaire measure?"; "The questionnaire allows students to think about their own work in class."). The individual interview guide, the focus-group interview guide, as well as the teacher's open-ended questionnaire were designed according to other studies (Bourque & Fielder, 1995; Dillman, 2000; Fink, 1995).

After making the necessary alterations according to the students' and teachers' comments and suggestions, we had a total of 19 items of MA that tapped on specific issues relating to MK and MS. Essentially, the items we considered as MK included, item 1: "I'm responsible for the work I do" (autonomy belief); item 2: "I am responsible for finishing tasks"

(theory about goal); item 4: "I work well when I study a lot" (belief of cognitive functioning); item 6: "I can do a good job" (belief about self); item 10: " I know my ways of learning" (theory about cognitive functioning); item 15: "I work well when the task is easy" (self and task belief); and item 16: "I feel I've learned if I get a good grade" (theory about goal). As for the MS items, we considered item 3: " I follow my teacher's instructions before I start a task" (orientation strategy); item 5: " I make an effort even if I don't like a task" (motivational regulation); item 7: " I make an effort to concentrate" (regulation of cognitive processing); item 8: " I like preparing my work" (motivational regulation and planning strategy); item 9: "I do something I like if I get a good grade" (motivational regulation); item 11: "I like tasks when I am doing them in class" (motivational regulation and monitoring strategy); item 12: " I am interested in tasks because I should pay attention" (motivational regulation); "item 13: I think about the work I've done" (evaluation strategy); item 14: " I make an effort if I really like the task" (motivational regulation); item 17: " I think about the work I'm going to do before I start" (orientation strategy); item 18: " I think about how I'm going to do my work before I start" (planning strategy); and item 19: " I tell myself I must be interested in assignments" (motivational regulation).

Preliminary Testing of the CATOM. The 19 item CATOM was then delivered on-line in EFL classes (with parent, school and student authorization) and was done individually in class by each of the 805 students with teacher guidance. This procedure was followed by all participants. It took students approximately 30 minutes to complete. Students were asked to give an example of the situations or similar situations that had happened to them in order to clarify whether or not they understood the items. If students still had doubts regarding a specific item, they asked either their teacher or the researcher to clarify. The researchers of this study observed the implementation of the instrument, so as to register any important

occurrences during each session and to help the students with any doubt that might emerge. Once we gathered the data, we proceeded with an EFA with FACTOR 9.20 (Lorenzo-Seva & Ferrando, 2013) in order to understand the instrument's structure in terms of the number of factors it would yield. Specifically, we were interested in seeing whether separate components would hold for MK and MS or a single unidimensional instrument of MA including both MK and MS. Essentially, if children distinguished between their metacognitive knowledge and skills or if they considered both as one construct of awareness of their metacognition.

Item Response Theory Approach. When we reached an interpretable structure for the instrument, which is described in detail in the results section, we proceeded to apply it a second time to 201 students. These students also performed an English task so as to allow us to assess their performance in EFL in comparison with their performance in the CATOM. As seen in previous studies (Ferreira, Almeida, & Prieto, 2011; 2012), we decided to use a type of statistical analysis that is distinct from the Classical Test Theory for this second analysis, because it would allow us to better understand students' ratings. Specifically, we proceeded with the Rasch analysis with the Winsteps program (Linacre, 2013) in order to assess the unidimensionality of the instrument, as well as to understand how the children had rated their MA. This software allowed us to estimate the students' score on a one-dimensional logit scale and evaluate the properties of the CATOM. Rasch polytomous methodology was adopted to analyze the instrument and the children's ratings. That is, we used the Partial Credit Model (PCM), which is an extension of the Rasch model for polytomous items (Rasch, 1980). Essentially, the PCM for linear measures of observations of ordinal scales is log $(P_{nik}/P_{ni(k-1)})/\Theta_n$-$\beta_i t_{ki}$, where P_{nik} is the probability that person n when encountering item i responds in category k. Accordingly, $P_{ni(k\_1)}$ is the probability that the

response is in category k-1, Θ_n is the ability of person n, β_i is the difficulty (or as proposed in this study, the level of rating) of item i, and t_{ki} is the step calibration in the rating scale threshold (which is defined as the position equivalent to the equal probability of responses in adjacent categories k-1 and k (Wright & Masters, 1982). In this study for instance, categories alter from 1 to 5 for MA. The higher score (5) represents overrating (always), whereas the lower score (1) represents underrating (never).

All items were assessed to understand whether they fit the model ($p < .01$) or whether there were items with excessive infit and outfit mean square residuals. That is, we considered to remove infit standardized mean squares higher than 1.4 and outfit standardized mean-squares higher than 2.0, as suggested in the literature (Bond & Fox, 2007).

Results

Exploratory Evidence of the CATOM

In a first attempt to interpret the internal structure of the instrument we developed a set of EFA with the data gathered from the 805 participants. Table 1 shows the correlations among all variables and the descriptive statistics. Item scores were uniformly positive correlations (most $r > .30$). Most of the variables were approximately normally distributed, with skewness values less than 2 and kurtosis values less than 5 (Bollen & Long, 1993). Nonetheless, items 14 ($S = -2.080$) and 16 ($S = -2.251$) were negatively skewed. Consistently with Bollen and Long (1993), there is multivariate normality if Mardia's coefficient is lower than P(P + 2), where P is the number of observed variables. In this study, 19 observed variables were used with a Mardia's coefficient for skewness of $65.39 < 19(19 + 2) = 399$ and for kurtosis of $604.09 > 19(19+2) = 399$. Hence, because of our kurtosis values, we used Unweighted Least Squares (ULS) as the method for factor extraction, an estimation method that does not depend on distributional assumptions (Joreskog, 1977). We also used polychoric correlations which are advised when univariate distributions of ordinal items are asymmetric for polytomous items (Brown, 2006; Muthén & Kaplan, 1985; 1992). Furthermore, the data was subjected to the Kaiser-Meyer-Olkin and Bartlett Sphericity test to check for an underlying structure of the data. Essentially, the Kaiser-Meyer-Olkin measure of sampling adequacy was .94, whereas the Bartlett Sphericity was $\chi^2_{(171)} = 3798.7$ ($p < .001$), demonstrating that the variables were suitable for factor analyses.

Table 1.

Item descriptive statistics, slope and threshold parameters and polychoric correlations

Variable	Mean (*SD*)	Factor Loadings	Slope and threshold parameters					Polychoric Correlations																	
			a	b_1	b_2	b_3	b_4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	4.46(.875)	0.607	0.76	-3.61	-3.05	-1.51	-0.69																		
2	4.25(.988)	0.603	0.75	-3.18	-2.61	-1.27	-0.15	0.40																	
3	4.46(.862)	0.596	0.74	-3.83	-3.19	-1.69	-0.71	0.39	0.32																
4	4.48(.869)	0.613	0.77	-3.47	-2.99	-1.60	-0.76	0.39	0.37	0.31															
5	4.33(.947)	0.623	0.79	-3.29	-2.60	-1.37	-0.35	0.31	0.38	0.41	0.33														
6	4.48(.824)	0.668	0.89	-3.46	-2.95	-1.47	-0.62	0.47	0.40	0.44	0.48	0.36													
7	4.40(.869)	0.704	0.99	-3.17	-2.71	-1.25	-0.40	0.41	0.43	0.42	0.44	0.48	0.42												
8	4.45(.884)	0.620	0.79	-3.54	-2.84	-1.52	-0.64	0.37	0.38	0.37	0.33	0.43	0.34	0.43											
9	4.27(.982)	0.509	0.59	-3.85	-3.31	-1.54	-0.31	0.32	0.27	0.26	0.36	0.30	0.38	0.36	0.30										
10	4.33(.956)	0.638	0.82	-3.17	-2.63	-1.24	-0.37	0.40	0.37	0.36	0.42	0.37	0.42	0.38	0.40	0.30									
11	4.50(.884)	0.615	0.78	-3.46	-2.84	-1.60	-0.85	0.36	0.38	0.39	0.30	0.44	0.41	0.45	0.45	0.21	0.33								
12	4.41(.854)	0.753	1.14	-3.01	-2.56	-1.20	-0.38	0.42	0.45	0.43	0.50	0.49	0.50	0.50	0.43	0.40	0.46	0.48							
13	4.25(.948)	0.628	0.80	-3.39	-2.65	-1.15	-0.13	0.36	0.32	0.37	0.32	0.41	0.36	0.44	0.44	0.33	0.48	0.37	0.47						
14	4.61(.763)	0.738	1.09	-3.26	-2.56	-1.60	-0.89	0.46	0.47	0.44	0.49	0.48	0.47	0.59	0.41	0.38	0.50	0.43	0.57	0.45					
15	4.05(.879)	0.598	0.74	-3.86	-3.22	-0.87	0.52	0.37	0.37	0.31	0.38	0.32	0.45	0.42	0.38	0.29	0.37	0.36	0.45	0.34	0.37				
16	4.59(.834)	0.582	0.71	-3.56	-3.18	-1.90	-1.18	0.37	0.34	0.40	0.37	0.30	0.45	0.31	0.35	0.26	0.37	0.38	0.38	0.33	0.46	0.40			
17	4.05(1.08)	0.567	0.68	-3.01	-2.52	-0.90	0.15	0.33	0.37	0.34	0.32	0.31	0.34	0.42	0.40	0.33	0.36	0.34	0.42	0.39	0.38	0.34	0.31		
18	4.18(.995)	0.578	0.70	-3.38	-2.76	-1.11	-0.00	0.30	0.30	0.31	0.30	0.32	0.39	0.47	0.37	0.29	0.36	0.35	0.46	0.42	0.37	0.35	0.33	0.29	
19	4.14(1.00)	0.643	0.83	-3.11	-2.38	-0.92	0.03	0.36	0.40	0.36	0.38	0.42	0.37	0.41	0.36	0.36	0.45	0.39	0.48	0.41	0.42	0.41	0.40	0.32	0.46

So as to determine the suitable number of factors to retain, various factor retention criteria were applied, specifically, Velicer's MAP test and Horn Parallel analyses. These tests are superior to other standard factor criteria, such as Cattell's Scree test or the Kaiser criterion (O'Connor, 2000). Consistent with the different retention criteria, one factor was obtained (MA) with 42.5% of explained variance. Also, the values of goodness-of-fit (*GFI* = .99), residuals statistics (*RMSR* = .037) and the Guttman-Cronbach's alpha coefficient (α = .93) were good in accordance with the literature (McDonald, 1999; Nunnally, 1978; Velicer, 1976). Table 1 also shows the item loadings, as well as the Normal-Ogive Graded Response Model (GRM) parameters, where most items revealed moderate item discrimination. Only item 9 revealed low item discrimination, having scored .591, as indicated in the literature (Baker, 2001). Item discrimination reveals how well an item separates respondents with abilities below the item location from those with abilities above the item location. Hence, we performed the analysis again without item 9 to see how the model would behave (see table 2). Moreover, the item difficulty appears for each item, but not for each category because the category distance is equal due to the GRM rating scale having the same response options across items. Lastly, because the participants' person-fit indices did not surpass 2.0 (Bond & Fox, 2007), we looked at person reliability and removed 53 participants whose person reliability was < .70 and conducted the analysis again. We wanted to check for person reliability because we have polytomous data, rather than binary data, and wanted to avoid any effects of guessing due to the multiple choice format of the questions in the instrument (see Ferrando, 2010). Table 2 shows a comparison between 4 proposed EFA models: (1) with all participants and item 9; (2) with all participants but without item 9; (3) without participants with low individual reliability and with item 9; and (4) without participants with low individual reliability and without item 9. The removal of the participants altered the parameters, although the values presented were still good. The removal of item 9 improved

the model essentially in terms of % explained variance (from 42.5% to 43%). In the next section, we present the results of a more detailed analysis using the IRT approach with a different sample which allowed us to confirm the permanence or removal of item 9 and, allowed us to draw more detailed conclusions about the participants' responses.

Table 2.

Proposed Unidimensional EFA model parameters of the CATOM

Proposed EFA Model*	Mardia's Coefficient		Kaiser-Meyer-Olkin	Bartlett Sphericity	% Explained Variance	GFI	RMSR	α	Eigenvalues
	S	*K*							
1	65.39 < 19(19 + 2) = 399	604.09 > 19(19+2) = 399	.94	χ^2_{171} = 3798.7 (p < .001)	42.5%	.99	.037	.93	7.492
2	60.00 < 19(19 + 2) = 399	547.27 > 19(19+2) = 399	.95	χ^2_{153} = 3629.6 (p < .001)	43%	.99	.037	.93	7.233
3	58.48 < 19(19 + 2) = 399	568.21 > 19(19+2) = 399	.94	χ^2_{171} = 3153.4 (p < .001)	39%	.99	.039	.92	6.763
4	53.60 < 19(19 + 2) = 399	514.83 > 19(19+2) = 399	.94	χ^2_{153} = 3019.9 (p < .001)	40%	.99	.038	.92	6.552

* Velicer's Minimum Partial Test used. Horn Parallel Analyses presented same values.

Measuring Perceived MA with the Item Response Theory Approach

We measured the reports of 201 students' MA (CATOM) and their performance in the English task with the IRT Approach in order to test the unidimensional structure of the instrument and in order to understand whether participants overrated their MA. None of the items showed infit/outfit higher than 1.5, (except for item 9, which had 1.7), as well as *z* statistic > 2.00. We then removed item 9 and carried out the analysis again (see table 3). All items were within the recommended parameters. Item 13 was the easiest or the least reported item with a reported/difficulty level of −.51 log, whereas the most difficult or most reported was Item 14 with a reported/difficulty level of .51 log. The distribution revealed a narrow range of difficulty (−.51 < *Di* < .51).

We also considered other reliability indicators from the Rasch measures for MA including, Cronbach's alpha, Person Separation Reliability and the Item Separation Reliability. The Person Separation Reliability indicates the proportion of the sample variance which is not explained by the measure error, while the Item Separation Reliability shows the percentage of item variance that is not explained by the measurement error (Smith, 2001). In this sense, MA revealed a Cronbach's *α* of .95, a Person Separation Reliability (PSR) of .87, and an Item Separation Reliability (ISR) of .87. These scores indicate good internal consistency reliability (Fox & Jones, 1998) and are higher than the model with item 9 (PSR = .86; ISR = .86). The Person Separation Reliability for MA also reveals, along with the difficulty indicators, that these children may have overrated their awareness of metacognition.

Table 3.

IRT parameters of the CATOM

	α	Item Separation Reliability	Person Separation Reliability
19-item Model	.95	.86	.86
18-item Model	.95	.87	.87

Figure 7 is a good visualization of how the children rated their MA. Our results revealed that these children's perceived MA (**θ =** 1.95) is considerably higher than their achievement in the English task (**θ =**-.89) represented in figure 8. Additionally, as seen in figure 3, Item 5 appears to have a considerable level of difficulty when compared with the other items of the English task. This may explain why the mean of the items' level of difficulty is higher than the mean of the children's performance.

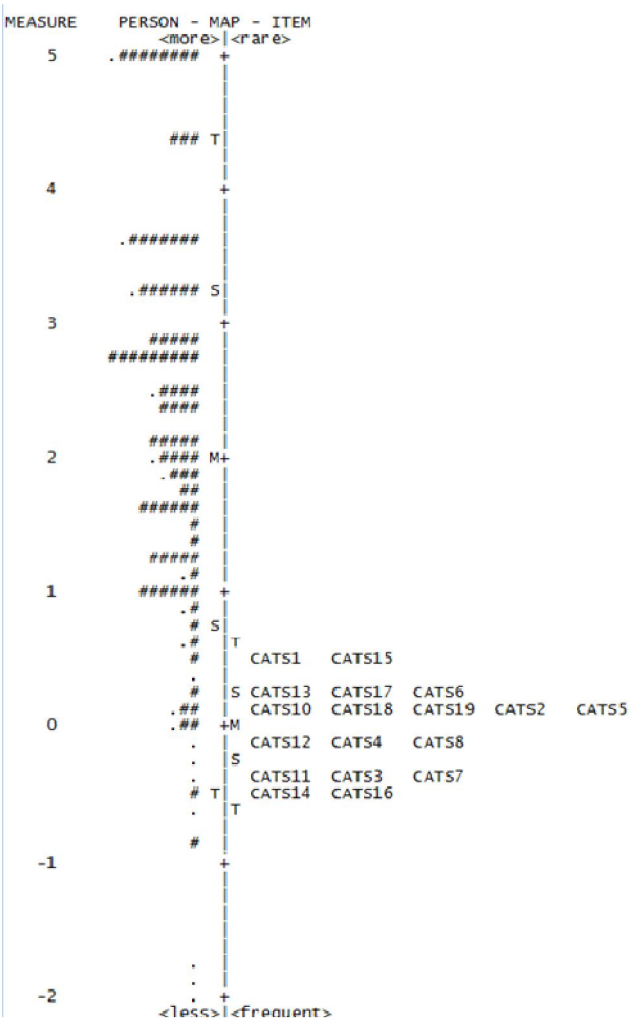


Figure 7 Person-item map for MA

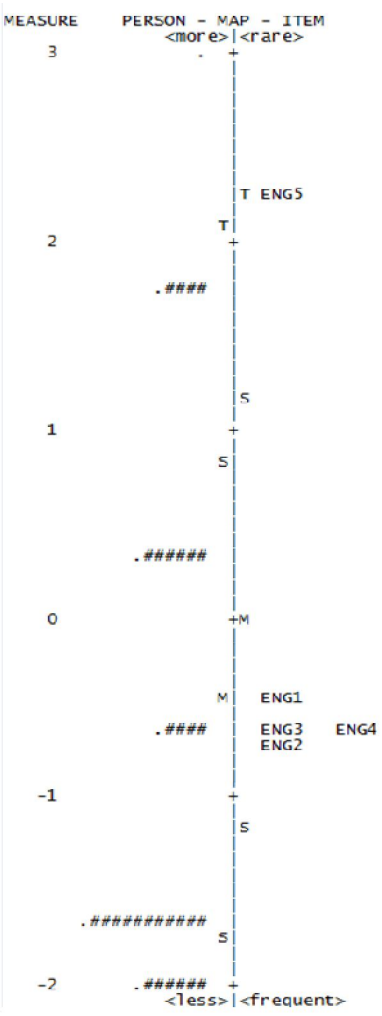


Figure 8 Person-item map for the English task

Discussion

This study presented a preliminary study that proposed an approach of how the person level (MA: MK and MS) of the MASRL model could be measured in fourth-grade children. Because the literature has indicated that it is still unclear and more empirical evidence is needed on how children acquire MA (Efklides, 2011), this study aimed to understand the

accuracy with which children reported their metacognitive functioning. Hence, besides testing the initial structure of the instrument with EFA analysis, we chose to use IRT, which allowed us to calibrate our participants and items on a common scale (De-Mars, 2010; Embretson, 1996). This type of measurement provided an analysis of the interactions between our participants and items, which aided us in interpreting the variables we wanted to measure. Moreover, the interpretations of the items in which participants had a higher probability of dominating was more convenient for our study than group-related ratings. In order to measure children's MA, and because the literature (Wigfield et al., 2011) has indicated a lack of studies and instruments with lower grade levels regarding metacognitive and motivational aspects of self-regulation, we developed the CATOM.

We constructed the CATOM in order to measure how children report their MA of their actions in class. We conclude that it serves its purpose of providing us with information regarding children's metacognitive functioning. We did not expect this instrument to be an event measure and to assess self-regulated learning as a process. Instead, we expected it to be a didactic tool that could give students and teachers information regarding MA and strategy use, as long as students were mediated through its completion. Its expected role, we believe, was confirmed by our results. This instrument is not a process measure to be implemented as students perform actions, but indeed a predictive measure that predicts students' perceptions of their knowledge/ tendencies to learn and is to be implemented prior to and subsequently to learning actions.

The psychometric data of the present study can be considered as a preliminary study of the CATOM with a representative sample of 4th grade students. The fact that our results

yielded a unidimensional tool indicates that children seem to interpret MK and MS as one construct only (MA), rather than two separate constructs. Also, our results allow us to present the CATOM which may be used to diagnose how children view themselves as metacognitively active agents in their learning process. This instrument could also serve to test hypotheses related to interventions and their expected outcomes in regards to metacognitive and motivational functioning. In fact, this scale could be useful to evaluate the results of an intervention program of self-regulated learning in Primary Education, along with other measures, such as diaries, to measure any changes occurring in terms of students' MA of the learning strategies they use inside classrooms.

In terms of the hypothesis of this study, we feel that the IRT analysis allowed us to interpret the results considering both person and item aspects accurately (De-Mars, 2010; Embretson, 1996). In this sense, results revealed from the reliability results that the item scores were good, including that alpha value (α = .87) of these items. From these results we feel that this instrument has potential for future use and testing in other contexts where MA is to be assessed. Our person reliability scores were also good (α = .87).

The item difficulty distribution of the CATOM was low in comparison with the students' responses, indicating that the children overrated their MA. In other words, although some studies indicate that children in primary school have the capacity of being consciously aware of themselves and of their thinking processes (Bronson, 2000), our results show that there is a tendency for them to overrate their MA. Results also showed that the distribution of the children's responses in the CATOM was higher than the item difficulty distribution. The reverse occurred in the English test, where the item difficulty distribution was higher than the

distribution of the children's responses. This leads us to conclude that although children may gain awareness and learn to use strategies intentionally in a self-regulated way, as some studies have stated (Pihlainen-Bednarik & Keinonen, 2010), they still have difficulty in reporting their MA, as there is a tendency of overrating (Allwood et al., 2005; Allwood et al., 2008; Shin et al., 2007). These findings are similar to those of Lipko-Speed (2013), who found that although young children' overconfidence lowers a bit when reporting about past performance with repeated trials of a same task, their reports continue to be inaccurate. Although the author worked with smaller children, she suggests that this may have implications for the future in terms of performance. That is, children can continue to be overconfident and overrate their performance (and in our study specifically, MA) even when confronted with feedback, which can lead them to lower performance levels (Stipek & MacIver, 1989). Hence, the author suggests repeated training to help children learn from past situations and transfer this knowledge to future learning tasks. We agree and recommend that future studies focus on training on how to regulate learning, where students could focus specifically on their MA with learning diaries for example, as seen in other studies (Schmitz & Perels, 2011).

We believe that in further testing of the CATOM, although we feel that a dynamic assessment approach to its application should continue to be considered, as recommended in other studies (Ahmed & Pollitt, 2010; Tzuriel & Shamir, 2002), a different on-line format of presentation may be applied, including hypothetical situations as examples and images that illustrate these examples. We also feel that this measure needs further testing in terms of the

discriminative validity, by focusing on other contexts (e.g. different country, different schools, different age group, etc...).

In terms of implications for practitioners in the field of education, we tried to contribute to research in the field of metacognition and self-regulated learning by developing and testing an initial factorial validation of a scale that would help psychology researchers and practitioners identify how learners view and report their use of MK and MS, which in turn, could guide teachers in adapting teaching strategies in order to attend to their students' needs. Considering the literature has suggested the need for a stronger link between theory and practice regarding the importance of attending to beliefs concerning knowledge and knowing, as well as their influence on strategy use, comprehension, conceptual change, and cognitive processing (Hofer, 2005), we consider that the use of the CATOM by psychology researchers and practitioners can help teachers come a step closer to understanding how students' reports of regulative functioning are important for academic functioning. As Boekaerts (2002b) suggested, teachers should have a good awareness of the potential positive and negative beliefs about different topics their students bring into the classroom. This type of knowledge will allow teachers to plan learning activities in coherence with students' belief. Since MK is founded on self-awareness, reflection and monitoring of cognition while the learner is not engaged in learning tasks, we feel that it would be beneficial for teachers to have knowledge about this aspect of their students' metacognitive functioning.

We think that this instrument may also be used in other studies with this particular age group along with other instruments and methods that are more process oriented (Efklides, 2008), such as semi-structured interviews (Zimmerman & Martinez-Pons, 1986), observations

of overt behaviour (Turner 1995), traces of mental events and processes (Winne & Perry, 2000), situational manipulations (Rheinberg, Vollmeyer, & Rollett, 2000) and diary keeping (Randi & Corno, 2000). Lastly, this study contributes to the literature on metacognitive aspects of learning because we chose to develop an instrument to measure fourth-grade students' way of reporting their MA through a dynamic assessment approach, considering most research investigating children's metacognitive aspects of self-regulated learning use other assessment methods, such as interviews (Throndsen, 2010), observations (Whitebread et al., 2009) and tasks (Borkowski & Turner, 1989; Krebs & Roebers, 2010). We feel that we have made a small contribution to the literature in filling in this gap.

CHAPTER II

Does training in how to regulate one's learning affect how students report self-regulated learning in diary tasks?

Introductory Note

> "Schools are knowledge organisations... They must therefore serve as catalysts for learning and discovery and the wellsprings of the knowledge society."
>
> (Hean, October 23, 2001)

In study two of this investigation, we considered the results of the first study and proposed to construct and test an instrument that would guide students in reflecting deeply on and consequently, self-regulate their learning process. The instrument presented in this study consists of a diary task that students can use on a daily or even a weekly basis in order to have a moment of reflection regarding tasks they have just accomplished. Upon developing this instrument, we were able to understand that it could capture change in students' reflections about their functioning in class and help them become more strategically reflective. Furthermore, as students filled in their diary tasks, the experimental group of this study experienced training in how to regulate one´s learning individually and collaboratively. By comparing this group with a control group, we were able to provide information about how the students in the experimental group learned about how they learned and how they improved their performance through the regulation of learning. In the conclusions of this study, we provide insights about how giving students opportunities to reflect on and enhance their learning through regulation is important for students to achieve better learning awareness and performance.

Does training in how to regulate one's learning affect how students report self-regulated learning in diary tasks?[2]

Abstract

The processes and perceptions of students' self-regulated learning are not easily measured. Thus, research has presented and suggested numerous ways in which these processes and perceptions of self-regulated learning can be investigated and assessed. Accordingly, this study aimed to assess whether training in how to regulate one's learning is related to students' growth patterns regarding their reported self-regulated learning activity over time. This study also investigates whether this type of training has an impact on students' reflective ability and academic performance. To reach these goals, we examined whether students' use of a diary task - developed by interviewing primary school students (n = 43) and validated with exploratory (n = 78) and confirmatory (n = 83) factor analysis - would capture change in students' reported self-regulated learning activity and reflective ability during training in how to regulate one's learning (students: n = 100; diary task entries: n = 1000). Students' academic performance was assessed with an oral and vocabulary task. Results from multilevel linear modeling revealed different growth rates of reported self-regulated learning activity over time between students who experience training and students who did not. Furthermore, pre and posttest results revealed that the students who experienced the training reported their reflections more autonomously and specifically in their diary task and had better academic performance than students who did not. These results demonstrate how the diary task captured change in students' perceptions, validating it as a monitoring tool. Lastly, implications for practitioners are discussed and suggestions for future studies are proposed.

Key-words: Self-regulated learning, Assessment, Learning diary task, Multilevel Linear Models

[2] Ferreira, P., Veiga Simão, A.M., & Lopes da Silva, A. (in press). Does training in how to regulate one's learning affect how students report their self-regulated learning activity in diary tasks? *Metacognition and Learning*.

Introduction

The regulation of learning is a fundamental requirement for the successful attainment of knowledge and skills in academic contexts and moreover, in life-long learning. It implies reflection, affect and action that are developed by learners in order to reach academic goals. Thus, these goals are pursued by learners proactively through learning which is self-oriented (Zimmerman, 2000). In the self-regulation of learning, learners become actively involved in self-awareness, self-motivation, and behavioral competence in order to develop the capacity to construct and employ knowledge appropriately (Wolters et al., 2003). Ultimately, meaningful learning depends greatly on the deliberate construction of knowledge and use of effective learning strategies in any context (McNamara, 2011). This study investigated whether training in how to regulate one's learning could somehow influence students' growth patterns of their reported self-regulated learning activity over time, their ability to reflect about their own functioning in class, and their academic performance. We use the term regulation of learning, as opposed to self-regulated learning when referring to training because students do not work and regulate their learning alone (self-regulate) in a classroom environment, but in collaboration with others (i.e. co- and shared regulation) (Järvelä & Hadwin, 2013; Määttä, Järvenoja, & Järvelä, 2012). Hence, in this study we use the term self-regulated learning when we refer to students' reports and reflections of their own functioning.

Zimmerman (2000) defined self-regulated learning as the degree with which learners metacognitively, motivationally, and behaviorally manage their own learning process. Particularly, learners are metacognitively aware and motivationally connected to how they regulate their learning by actively adapting strategies to execute specific learning tasks. Additionally, Zimmerman presented the process of regulating one’s own learning in three cyclical self-regulatory phases. Specifically, the forethought phase, where learners set objectives and plan before a task, the performance phase, where learners monitor and

control their performance while they execute the task, and the self-reflection phase, where learners react to their own outcomes once the learning process is completed. As Zimmerman stated, these phases may help clarify learners' repeated efforts to learn in terms of quantitative and qualitative differences (i.e., proactive vs. reactive self-regulators), such as when learning a new language (see Zimmerman, 2013). Zimmerman and Martinez-Pons (1986) found several strategies for regulating learning that are associated with covert (i.e., goal setting and planning, organizing and transforming, seeking information, and rehearsing and memorizing), behavioral (i.e., keeping records and monitoring, reviewing records, and self-evaluation), and environmental (i.e., environmental structuring, seeking social assistance, self-consequences, and environmental structuring) forms of self-regulated learning. In the present study, students were taught these strategies in a sequence to help them develop skills that would allow them to plan (forethought phase), monitor (performance phase) and self-evaluate (reflection phase) their performance.

The literature regarding the regulation of learning in classroom contexts has suggested that research should focus on how the processes involved in the regulation of learning are taught (encompassing goal establishment, assessment of learner beliefs about learning and self-evaluation), as well as on the precision with which learners report and register their use of self-regulatory processes (e.g. Winne, 2011; Zimmerman, 2008). Bandura (2006) proposed how learners' behavior is conditioned by external aspects and by their beliefs about how they can perform in specific domains. Thus, Bandura posited how it is also imperative that learners learn to self-monitor and regulate their thoughts, emotions and actions. Accordingly, since some studies have raised questions about existing instruments and their ability to capture self-regulated learning processes and perceptions about those processes as they occur, research should focus on process studies using different tools, such as diary tasks (e.g. Azevedo & Cromley, 2004; Schmitz, 2006; Schmitz, Klug, & Schmidt, 2011).

Cleary (2011) suggested the use of microanalysis as a way to measure learners' regulatory beliefs and reactions as they engage in academic tasks. According to Cleary, self-regulated learning is viewed by most scholars as dynamic and fluid, rather than static. Hence, microanalysis and the use of diary tasks for instance, are alternative approaches to standard scales, which help interpret the regulation of learning as a global construct. Microanalysis refers to a detailed form of measuring specific processes and behaviors as they occur "in real time across authentic contexts" (Cleary, 2011, p. 330). Moreover, self-regulated learning microanalysis focuses primarily on the beliefs and processes involved in self-regulation which are often covert. These beliefs and processes are examined through the use of structured assessment tools that evaluate the cyclical phases of self-regulated learning "at strategic moments during a specific activity" (Cleary, 2011, p. 331). Diaries, for instance, are able to capture changes that may occur in these processes and behaviors (Schmitz, 2006). Cleary (2011) suggested important aspects of contemporary microanalytic assessment protocols, such as individual administration, the study of the three self-regulated learning phases proposed by Zimmerman (2000), connecting these phases to the before, during and after moments of an event, context-specific microanalytic questions, and lastly, recordings and coding of learners' responses.

In this study, we introduced a diary task that could provide detailed information about students' awareness of their self-regulated learning activity and that could capture change in students' reflections about learning. As Boekaerts (2002b) and Hofer (2005) stated, teachers should have a realistic view of students' beliefs and perceptions regarding learning when planning learning activities. Moreover, in light of the rising learning demands of the 21st century, students must engage proactively and strategically in their academic path. We argue that students can begin working from early on in their academic career in order to contribute to their life-long learning process efficaciously. The development and adaptation of

motivation, behavior and new competencies are increasingly important for students to flexibly and autonomously manage their learning. Hence, we also presented an example of training in how to regulate one's learning, as a potential guide for teachers when designing meaningful learning environments through the adaptation of pedagogical practices to attend to their students' needs.

Thus, we first examined students' reported self-regulated learning activity (in the diary task) over time, and assessed whether training in how to regulate one's learning could be related to their growth patterns. By reported self-regulated learning activity, and in accordance with Zimmerman's model of self-regulated learning (2000) and Bandura's theory of Human Agency (2006), we mean that students are self-regulators and once they have adopted intentions and action plans, they build a course of action, motivate and regulate their execution (self-regulated learning activity), connecting thought and action. Therefore, students in this study reported their immediate self-reactions about their self-regulated learning activity in class.

Secondly, this study investigated whether the training in how to regulate one's learning had an impact on students' reflective ability (i.e. reported intentions to learn, reported anticipations of learning outcomes and reported self-examination). Specifically by reflective ability we mean, and again considering Bandura (2006) and Zimmerman's (2000) work, that students are planners with a deliberate capacity to make choices and set goals, they are forethinkers who anticipate outcomes of prospective actions, and self-examiners who have the metacognitive capability to examine their own functioning by reflecting on their own efficacy, appropriateness of thoughts and actions, as well as on the value of their own efforts.

Thirdly, this study investigated whether the training in how to regulate one's learning had an impact on students' academic performance. We also discuss in this paper how this training and using a diary task that follows contemporary microanalytic assessment protocol

guidelines may be an important approach to measure students' reported self-regulated learning activity and reflective ability. Specifically, we proposed to answer the following questions:

Are there differences in growth rates of reported self-regulated learning activity over time between students who experience training and students who do not?

Do students who experience training report their reflections more autonomously and specifically in their diary task than students who do not?

Do students who experience training have better academic performance than students who do not?

Children's Self-Monitoring with Diary Tasks in Domain-specific Contexts

Self-monitoring is the ability learners have to pay attention to and closely observe their own learning behavior at a meta-level in order to verify and/or adjust their management of learning during present and future efforts to learn (Zimmerman, 1989). Winne (2011) posited that because metacognitive monitoring guides learners' choices about learning, it is vital to understand their perceptions of the learning context. What's more, and in line with Klug and colleagues (2011), monitoring is a high-order operation of self-regulated learning in the sense that it provides learners with feedback regarding purposeful behavior and learning outcomes. Self-monitoring can be fostered in children and other age groups through self-recording with the use of standardized learning diary tasks, which in turn, trigger a positive reactivity effect, leading to deep reflection about their own learning behavior and learning process and thus, directing them towards better academic performance (Schmitz & Wiese, 2006). Current research has proposed that children aged 8 to 10 have the capacity to regulate their learning, while using metacognitive processes consistently and maturely (e.g. Bares, 2011). What's more, the literature has also suggested that children in this age group are also capable of

making accurate and differential judgments regarding their self-regulation competencies when the evaluation method is appropriate for their age (Rizzo et al., 2010).

Recent studies have revealed how learning diary tasks stimulate learners to reflect on, inquire about and gain awareness of their learning experiences (Alterio, 2004; Ghahremani-Ghajar & Mirhosseini, 2005; Simard, 2004). Additional evidence has shown that the act of registering experiences in a learning diary task can capture occurrences and reveal feelings and thoughts during the process (Boud, 2001). What's more, empirical findings have demonstrated that learning diary tasks are effective cognitive tools and/or learning methods that provide learners with important insights into how they perceive their learning experiences and can ultimately help them reflect on new acquired information (Hiemstra, 2001; Kaur, 2003). Further studies have sought to understand how learning diary tasks can be effective with children (4th grade) along with interventions in how to regulate learning, providing thus a better development of self-regulated learning processes and improved academic performance (Otto, 2007; Stoeger & Ziegler, 2010).

Some authors have highlighted how interventions in regulating learning as a process can be appropriate for different age groups (Klug et al., 2011) and for elementary school children in particular (Glaser & Brunstein, 2007). Schmitz and Perels (2011) for instance, investigated the effect of an intervention in self-regulated learning on 8th grade students who filled in diary tasks for a period of 49 days during math homework activities. Through trend analysis, the authors found that there was a highly significant positive linear trend in favor of the group that received the training. Also, through pre-posttest measures, the authors found an increased self-regulation in the students that experienced guidance in how to regulate learning.

In view of these studies, and in an attempt to answer our questions about the effects of training in how to regulate one's learning on how students report their self-regulated learning activity in their diary task, we present our first hypothesis. Hence, we hypothesize that:

H1: There are different growth rates of reported self-regulated learning activity over time between students who experience training and students who do not.

Stoeger and Ziegler (2008) conducted a 5-week intervention study where 4th grade teachers gave their students training in how to regulate learning in math classes. With the data from the diary tasks and other pre and posttest instruments such as questionnaires, the authors found that students who experienced the training revealed a greater increase in effort, task interest, learning-goal orientation, and perceptions of self-efficacy, than the students in the control-group. In a later study, the same authors (Stoeger & Ziegler, 2011) found similar results with the implementation of a training module on how to regulate one's learning on 4th grade students studying math for 6 weeks. Through hierarchical linear modeling analyses, the authors found that students who experienced training in self-regulated learning with the use of learning diary tasks, displayed a greater level of learning-goal orientation, task interest, effort and perceptions of self-efficacy, than learners who did not. Hence, training in how to regulate one's learning was successful and was recommended for learners as young as those in elementary school.

Perels, Otto, Landmann, Hertel and Schmitz (2007) analyzed self-regulation from a process perspective and studied the impact an intervention program had on the development of self-regulation with data gathered from 8th grade students' diary tasks. The authors found an impact of the training regarding planning, resource use, learning environment structuring and distraction management through time series analysis, as well as significant trends for starting to learn at a planned time, self-monitoring, and self-reflection with trend analyses.

We believe that through the type of impact that Perels and her colleagues (2007) found, students' intentions to learn, expectations of learning outcomes and self-examinations/reflections about past experiences may also be affected. Thus, we expect that training in how to regulate one's learning affects how students report their reflections as strategic and autonomous agents. Accordingly, we assume that:

H2: Students who experience training report their reflections more autonomously and specifically in their diary task than students who do not.

Still regarding self-regulation aspects, but also focusing on academic performance, Perels, Dignath and Schmitz (2009) worked with 6th grade students using diary tasks as well, and investigated whether training in how to regulate one's learning could influence students' capacity to self-regulate and to achieve better academic performance in math. By means of analyses of variance with time as a repeated measurement factor and analyses of covariances, the authors found that there were significant interactions between time and group for most of the self-regulated learning variables in favor of the group that had training. Essentially, this study demonstrated that training in how to regulate one's learning could support self-regulation competencies and math achievement, thus revealing higher scores for the experimental group.

Glogger and colleagues (2012) analyzed whether the quantity and quality of learning strategies measured by diary tasks could predict learning outcomes and whether different effective combinations of strategies could be identified. With the responses of 9th grade students in math and biology classes for a period of 6 weeks, the authors found through hierarchical linear modeling that the quality and quantity of cognitive strategies predicted learning outcomes. The authors also found through cluster analysis that learners who combined cognitive and metacognitive strategies were more successful. Overall, the authors

concluded that using diary tasks was a useful way of assessing self-regulated learning strategies.

Otto (2007) worked with 4th grade students and investigated a 5-week intervention program which aimed to promote the regulation of learning in mathematical problem solving. Students were divided into five groups, namely, a simultaneous student, parent and teacher training group, a simultaneous student and instructor training group, a simultaneous parent and teacher training group, a teacher training group and a non-training control group. Through longitudinal (pretest, posttest, stability measurement) and procedural data (trend analysis of standardized learning diary tasks), the author found significant positive effects regarding self-regulated learning strategies and performance in math, mostly in regards to the group of students who had direct self-regulated learning training and used the diary tasks.

In the present study, students participated with diary tasks and had training on how to regulate one's learning in EFL class. Learning a foreign language implies learning a language other than the learner's first language, the language of instruction or a second language, which is the language of instruction for learners with a minority background (European Commission, 2011). Oxford (2003) indicates how learning a foreign language efficiently is in part determined by learners' learning styles and strategies. Furthermore, language learning strategies that are chosen intentionally, function as a means for conscious regulation of learning. Hence, being aware of how to learn a language more efficiently by practicing goal-setting, self-monitoring and self-evaluation can lead to autonomous language learning.

In a theoretical and empirical review of studies focusing on metacognitive knowledge and language learning, Rahimi and Katal (2012) discussed how learners who are aware and act consciously to understand what they are doing by using different strategies to plan, monitor and evaluate their learning, are usually the most successful learners in foreign language learning. Some authors (Kirsch, 2012; Larkin, 2010) have argued that providing

young learners with opportunities for reflection while learning a foreign language, such as English, enables them to enhance their strategy use, develop self-regulation, autonomy and proficiency in using the language. Specifically, Larkin (2010) provided evidence that with time and reflection, learners are capable of developing metacognitive and metalinguistic awareness, allowing them to improve their use of the language. Hence, providing learners with tools that allow them to reflect, is imperative for effective language learning. Some of the literature on learning EFL has indicated that using diary tasks can be beneficial with young learners because they can be a good tool for reflection and awareness of learning interests and difficulties (Kir, 2012). Nonetheless, Rahimi and Katal (2012) suggested how more research is needed to understand how learners can become metacognitively aware and efficient regulators of their own language learning in EFL settings. Accordingly, Greene, Bolick and Robertson (2010) claimed that research needs to study the regulation of learning processes in different domain-areas other than math and sciences (areas which have been focused on in the vast literature on the regulation of learning). Thus, we also decided to focus on the academic performance of students in an EFL context (i.e., oral practice and vocabulary in EFL, as described in the method section) and hypothesized that:

H3: Students who experience training will have better academic performance in EFL than students who do not.

Method

Study design

A quasi-experimental control-group design with repeated measurements (with pre and posttest) was used with process data gathered in a real life context (Klug et al., 2011).

Participants

The convenience sample used in this study consisted of a total of 204 students in EFL classes. All participating students were of middle class families (94% Portuguese, 4% Brazilian and 2% Angolan), all spoke Portuguese fluently and all were in the fourth grade of different schools in the Lisbon area. Also, all were in the same level of EFL (A1 level – basic user) according to teachers' indications, which were in line with the Common European Framework of Reference for Languages (Council of Europe, 2011). While 43 (*M* = 9.23 years, *SD* = .84, 54% boys) students participated in the preliminary development of the quantitative items of the diary task, 78 (*M* = 9.3 years, *SD* = .51, 55% boys) participated in the first pilot study (exploratory factor analysis) and 83 (*M* = 9.4 years, *SD* = .62, 54% girls) participated in the second pilot study (confirmatory factor analysis). A total of 100 students (*M* = 9.2 years, *SD* = .42, 53% boys), with their respective teachers participated in the main study presented here, allowing us to gather 1000 diary task entries for data analysis with multilevel linear modeling. The experimental group was composed of 40 students, while the control group was composed of 60 students. This distribution was based on the willingness of the groups' respective teachers to participate in the training sessions.

Instruments

Diary Task. The Diary of Guided Self-regulated learning (DOGS-RL) is based on the literature mentioned (e.g. Bandura, 2006; Schmitz & Wiese, 2006; Schunk & Zimmerman, 1998; Zimmerman & Martinez-Pons, 1986) and consists of a total of three open-ended questions, three dichotomous questions and 12 quantitative items that should be completed in class individually. The open-ended qualitative items of the diary task (α =.80) (i.e., "Today in my class I want to learn..."; "In my class today I will be able to..."; "Today in my class I learned...") are based on recommendations in the literature (Bandura & Locke, 2003; Cleary, 2011; Zimmerman, 1989), and specifically in the areas of Agency of Intentionality,

Forethought and Self-reflectiveness (Bandura, 2006), which fit in with the various subprocesses of self-regulated learning (Cleary, 2011; Zimmerman, 2008). The scores for these questions were developed according to guidelines in the literature (Kember, 2004; Kember, McKay, Sinclair, & Wong, 2008; Wong, Kember, Chung, & Yan, 1995) and students' responses.

Specifically, the first part of the diary task (see Figure 9) begins with two open-ended questions that are meant to be responded before efforts to learn in class. The first question asks about the students' intentions to learn ("Today in my class I want to learn..." coded on a scale of 9 points: from 1 = irrelevant comments to 9 = specific and autonomous goal regarding strategic action) and the second asks about the students' anticipations of their learning outcomes/performance ("Today in my class I will be able to..." coded on a scale of 7 points: from 1 = irrelevant comments to 7 = specific anticipation regarding strategic action).

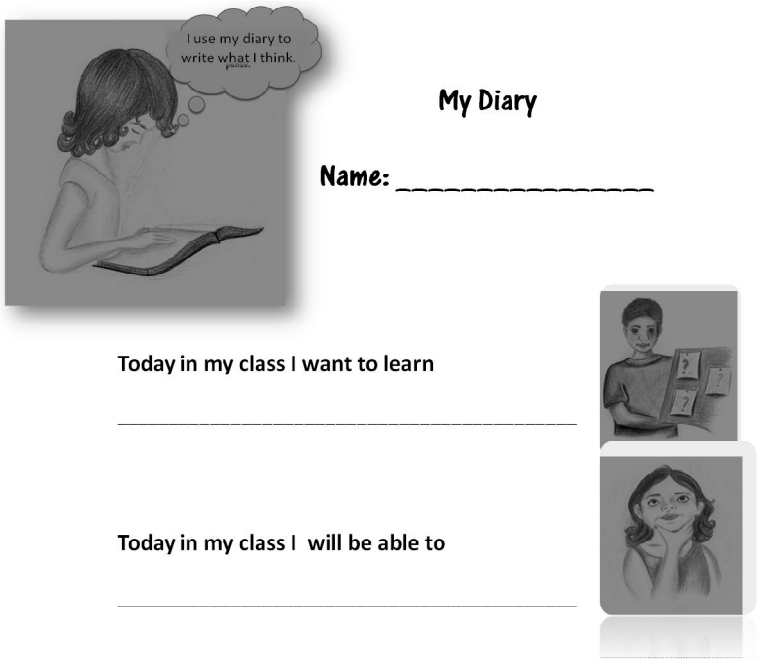


Figure 9. First part of the diary task with the first and second open-ended questions.

The second part of the diary task is meant to be responded to immediately after students engage in learning activities in class (see Figure 10). This second part includes three blocks of questions, the first about forethought, the second about performance and the third about self-reflection (three cyclical phases of self-regulated learning), as well as a last open-ended question. The block of questions about forethought begins with one dichotomous question ("Did I plan my work in class today?") which is to be responded on the basis of yes or no. If the response is yes, the students move onto the next question about planning ("How?") to help them focus on what they actually did in context. Accordingly, they then respond to the four quantitative items about forethought ("I liked to plan my work"; "I found it difficult to plan my work"; "I made an effort to plan my work"; and "I was able to plan my work") from 1 (not at all) to 4 (a lot). The remaining two blocks of questions about performance ("Did I correct my work as I did it in class today?") and self-reflection ("Did I evaluate my work in class today?") present the same structure. Lastly, the diary presents one last open-ended question ("Today in my class I learned..." coded on a scale of 7 points: from 1 = irrelevant comments to 7 = specific cognitive and/or affective self-reflection regarding strategic action), where students report their self-examinations.

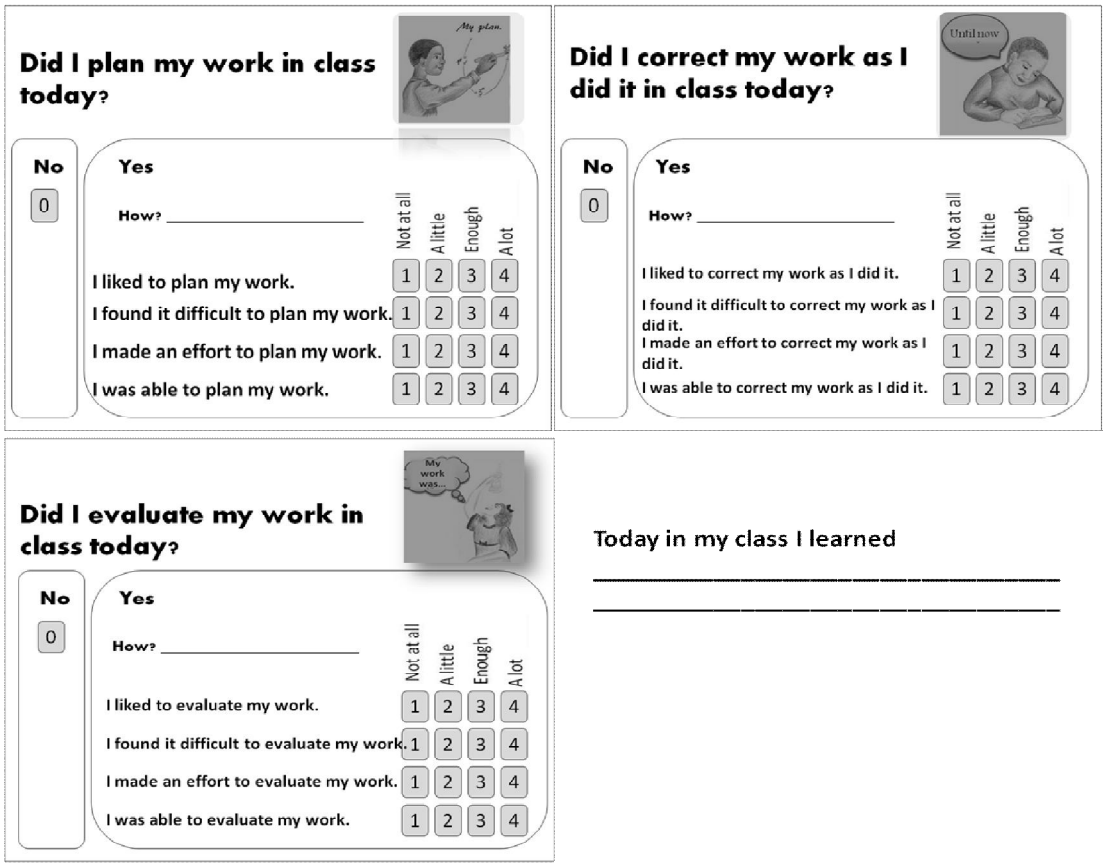


Figure 10. Second part of the diary task with the three blocks of quantitative items for forethought, performance and self-reflection, as well as the third open-ended question.

The full structure of this diary task asks students about all of the phases of the self-regulated learning cycle, including forethought, performance, and self-reflection in accordance with contemporary microanalytic assessment protocols as suggested in the literature (Cleary, 2011).

Other measures. The purpose of using an English oral task and vocabulary task about sports was to measure students' academic performance, since oral and reading skills are the most predominant in EFL classes in fourth grade in Portugal. An oral task (α = .84) was administered to students, where they had to describe in English what they saw in 10 different pictures about sports. Students were rated from 1 to 5 on the basis of whether they said no words (1), non-related words (2), related words (3), related sentences with mistakes (4), and related sentences with no mistakes (5). Also, students answered a 33 item English

vocabulary test online about sports (α = .85), where they had to identify objects in the pictures and were scored dichotomously on whether they got the answer correct or incorrect. Both of these measures were developed according to the content in the national curriculum of EFL for primary education and with the help of two primary school teachers. We checked for face and content validity of these measures by interviewing two other teachers regarding specific content-related questions (i.e., "What does the task assess?"; "What's the objective of the task?" and "Do you think it is suitable for these students... if not, make suggestions.").

Procedures

Developing and testing the Diary Task. In order to construct the quantitative items of the diary task, we interviewed 43 fourth-grade students from a different academic community based on previous theory and research (Zimmerman & Martinez-Pons, 1986; Zimmerman, 2008). The Self-regulated Learning Interview Schedule (Zimmerman & Martinez-Pons, 1986) was translated and adapted (with a forward and back-translation of two bilingual researchers in the area of self-regulated learning and with pre-testing and cognitive interviewing of 3 volunteer students) to the students' academic conditions in fourth grade according to APA guidelines (Gudmundson, 2009). Because we wanted to implement the diary task only inside the classroom, we only focused on two specific learning contexts, namely classroom learning (question 1 of the SRLIS: "Assume your teacher is discussing a topic with your class, such as World War II, and he or she says that you will be tested on the topic. Do you have a particular method to help you learn and remember what was discussed in class?") and self-evaluation (question 8 of the SRLIS: "When taking tests in English, science or history, do you have a particular method for making sure your answers are correct before handing in the paper?").

Students' responses were first analyzed according to Zimmerman and Martinez-Pons' (1986) recommendations. Various strategies in classroom learning were identified as occurring frequently, namely: rehearsing and memorizing (e.g. "I am able to learn the material

by practicing it a lot of times and correcting myself as I read it"), seeking information (e.g. "First I can do what is more difficult and search for it in my notebook."), reviewing records (e.g. "I like to reread my notes in order to learn and be prepared"), keeping records and monitoring (e.g. "I make an effort to take down notes of the difficult things in general and study them") and organizing and transforming (e.g. "First I like to plan my work by making an outline of the material so that I can learn it"). As for the context of self-evaluation, students mainly referred to self-evaluation (e.g. "I like to check if my text is good and I can correct what is wrong"; "It is difficult, but if I have time, I can correct my work"), and rehearsing and memorizing (e.g. "I can remember the material and try to concentrate so I can see if I am correct).

With the help of two primary school teachers, we performed content analysis of the students' responses in order to design the diary task. Common key-processes were identified in the students' discourse, such as, "liking to do something", "finding something difficult", "making an effort" and "being able to accomplish something". An initial 28 items were developed. After careful consideration with the two teachers in terms of item construction and difficulty of interpretation on the students' behalf, only 12 were considered for the diary task. First, students had to decide whether or not they had performed the action mentioned and answer no or yes. From there, if they answered yes, they would continue and answer not at all (1); a little (2); enough (3); or a lot (4) for each item pertaining to that action. The items were categorized into groups depending on the self-regulatory action (e.g. "I was able to prepare my work in class today.", "I found it difficult to correct my work as I did it in class today.", " I made an effort to evaluate my work in class today."). We wanted students to reflect on activities that they had just performed in class with the diary task, therefore, we used the simple past tense for all items (i.e., "Did I plan my work in class today?.").

We did a first pilot study (exploratory factor analysis) with 78 students to test the internal structure of the dairy task. For a confirmation of our results we did a second pilot study and asked 83 students to fill in the diary task. We tested our model with confirmatory factor analysis. To understand how students would react to the instrument in terms of motivation to respond during a prolonged period of time and difficulty in interpreting instructions, we had all students fill in the diary task during 10 lessons. This allowed us to understand the difficulties that students had in filling in the diary task and to perfect the instructions provided to students on how to fill in the instrument. Nonetheless, both in the exploratory factor analysis and in the confirmatory factor analysis, we opted to use students' responses from the last session.

The Main Study. Once the diary task had been developed, we used it in our main study. We applied it in 12 EFL classes of 45 minutes twice a week over a period of six weeks on 100 participants. We opted for this number of weeks as in previous studies with interventions in how to regulate one's learning and diary task data (Otto, 2007; Stoeger & Ziegler, 2008). We chose to have students complete their diary tasks individually in class because they were young learners who could have doubts clarified by the teacher as they emerged and we could have a better account of how they reacted to the diary tasks. In addition to being implemented in class and because using diary tasks over a period of time implies motivated students (Schmitz & Perels, 2011), we asked students and teachers in individual interviews (among other aspects mentioned in the following section) how students had reacted to and had felt about the diary task after the intervention (illustrative student responses in Appendix B). We only used the information from these interviews to give us an idea of how students reacted to the diary task. The two initial applications of the diary task (the first week) were done so that the students could be familiarized with the instrument and

the training in how to regulate one's learning. Hence, of the 12 diary tasks each student filled in, only 10 diary task entries per student were considered for analysis in this study.

The students (*n* = 100) were divided into an experimental group (*n* = 40), which was composed of three groups of students and their respective teachers (2) and a control group (*n* = 60) which was composed of four groups of students and their respective teachers (4). The assignment of classes to the experimental and control groups was based on whether the teachers were willing to participate in the training sessions. Students in the experimental group were given training in how to regulate one's learning twice a week for a period of six weeks in 45 minute sessions by their teacher. All students considered all of the questions in the diary task in each session and filled in the diary task autonomously according to their perceptions of what they had done in each session.

The responses to the open-ended questions of the diary task were coded by 2 different raters across the 100 participants. We found no example of irrelevant comments (coded as 1) in the students' diary tasks for the first open-ended question (intentions to learn). Examples of students' responses) to the first open-ended question include "today in my class I want to learn to correct my mistakes by reading the story many times" (coded as 9: specific comment related to autonomous goal about strategies to adopt to learn content). For the second open-ended question (anticipations of learning outcomes/performance), examples of students' responses include "Today in my class I will be able to do nothing" (coded as 1 = irrelevant comment) and "Today in my class I will be able to evaluate my work by reading my story many times" (coded as 7 = specific comment about anticipation related to strategies to adopt to learn content). As for the third open-ended question (self-examination), examples of students' responses include "Today in my class I learned more of nothing" (coded as 1 = irrelevant comment) and "Today in my class I learned to evaluate my colleague by listening to his narration a few times" (coded as 7 = specific comment relating to cognitive and or

affective reflections about strategies used to learn content). For the complete rating scale of the open-ended questions and corresponding examples see Appendix C.

In order to verify the inter-rater reliability, we computed an intraclass correlation, which gave us good values for the ICC (2, 2) = .99, according to the literature (McGraw & Wong, 1996). Essentially, 99% of the variance in the mean of both raters was true score variance. Furthermore, as a way of measuring academic performance in EFL, students also executed an oral task and an online vocabulary task before and after the intervention.

All teachers were informed about how the diary task should be filled in, as well as how this tool may bring advantages (i.e., awareness of strategic action) and disadvantages (i.e., students getting tired of filling in the diaries), as recommended in the literature (Glogger, et. al., 2012). The teachers of the experimental group had prior preparation regarding the regulation of learning. They were introduced to Zimmerman's (2000) model of self-regulated learning and to the strategies presented in Zimmerman and Martinez-Pons' (1986) study. The researchers discussed these studies with the teachers and answered any doubts that arose. The teachers then had a workshop where they shared how they regulated their own learning with the researchers and whether and how they usually taught learning strategies to their students.

Presenting the Training. The training in how to regulate one's learning was designed to develop awareness in using strategies to regulate learning during regular EFL classes according to Zimmerman's model of self-regulated learning (2008). Hence, a two-class introduction to the regulation of learning and to the diary tasks was done and a unit of ten lessons about sports was delivered to the students by their corresponding teacher. Teachers had a daily meeting with the researchers to discuss and prepare classes and to provide feedback regarding the students' behavior during the lessons and the completion of the diary task. The training sessions were observed by a researcher in order to understand whether

the training was being implemented properly. Also, in the interviews with students and teachers at the end of the training sessions, we tried to understand their perspective of the occurrences in class. Data from the daily meetings with the teachers, observation notes and interviews were rated by 3 independent raters in order to establish the fidelity of the implementation. This fidelity measure consisted of five questions concerning the objectives of the training regarding the cyclical phases and strategies of self-regulated learning proposed by Zimmerman (2000). Each question was rated on a scale of 0 (was not implemented according to the objectives) to 10 (was fully implemented according to the objectives). Then, in order to verify the inter-rater reliability, we computed an intraclass correlation, which yielded good values for the ICC (2, 2) = .91, according to the literature (McGraw & Wong, 1996). Specifically, 91% of the variance in the mean of both raters was true score variance.

Because of space limitations, we briefly present a synopsis of the training sessions of the experimental group. Note that the main topic of the sessions was sports. In Portugal there are few differences as to the knowledge both men and women have about different sports and inclusively in later years, a substantial amount of effort has been made to provide equal opportunities for both men and women, although the latter still strive to have the same working conditions (Jaeger, Gomes, Silva, & Goelner, 2010). Hence, we did not feel that boys and girls would react differently to the topic. The sports were presented by themes (i.e., water sports in lessons three and four, indoor sports in lessons five and six, velocity sports in lessons seven and eight, bravery sports in lessons nine and ten and hit and kick sports in lessons eleven and twelve). In each session students had the freedom to choose from two different sports to learn fluency and develop strategies to regulate their learning. Furthermore, the characters in the exercises prompted students to check whether they were proceeding correctly and whether they had to correct their work throughout the lessons. Other prompts, such as attention notes were also included. This would help students be

aware of strategies they could use or reconsider when performing tasks. All of the prompts and instructions were provided to students in both English and Portuguese, as recommended by the national primary education curriculum of EFL in Portugal. All content-related texts were presented in English only. Also, the students filled in the first part of the diary task in the first five minutes of each session and the second part of the diary task immediately after each session.

Sessions 1 and 2: Introduction to self-regulated learning and diary tasks. In the first two sessions students were introduced to the regulation of learning as an autonomous, but guided way of using strategies to learn. They were also told that they could work collaboratively if they wanted to and that they would get prompts that would also guide them in using strategies and in working either individually and in pairs/groups. Explanation of concepts and examples given were simplified considering the population encompassed fourth-grade students. Also, an introduction to how the diary task could be filled in was given. Students were informed that they were going to fill in this diary task at the beginning and end of each session. In these first two sessions students practiced using the diary task so they could understand what they needed to do and the options they had within the diary task. This would allow them to clarify any initial doubts.

Sessions 3 and 4: Planning phase: Task analysis - strategic planning and setting objectives to practice water sports. In session 3 three different images were presented to the students, each one depicting a different concept (objectives, following instructions and preparing work - planning). Each concept was explained to the student and doubts were clarified. These images were then hung on the wall and remained there for the following 9 lessons. Then, two short stories were introduced to the students about a character practicing water sports so that they could read aloud (narrate). After students read the story aloud, they did a post-reading activity that focused on identifying the character's objectives and the

decisions he made in order to prepare for his sport. They also made a plan to help this character achieve his objectives. This exercise also focused on reading practice.

In session 4 the three different images depicting the different concepts (objectives, following instructions and preparing work - planning) were reviewed. Students responded to concept questions in order to remember what they had learned in the previous session. The teacher then asked students to think about their plan from their previous lesson in order to help the story's character perform better in that particular sport. Then, the students had to imagine they were going to practice that sport and write about how they would prepare for it. Lastly, an open class discussion was held so students could reflect as a group about their plans.

Sessions 5 and 6: Planning Phase: Self-motivation beliefs, self-efficacy and task interest in indoor sports. In session 5 the concepts from the previous two sessions were reviewed and three different images were presented, each one depicting a different concept (likes to..., can... and responsibility). They presented each concept to students and answered questions. These images were hung on the wall next to the other concept images. Two stories relating to the concepts that were discussed and to indoor sports (i.e. basketball and ping pong) were presented to the students. Then, students worked on an activity where they identified the character's objectives and decisions in order to prepare for the game. They also focused on what the character thought he could do and if he liked to play that particular sport. Students practiced listening, reading and speaking skills.

In session 6 the concepts from the previous two sessions were reviewed and students' doubts were clarified. Then, the students were introduced to making a critique. From here, students proceeded to plan and elaborate a critique of the story (collaboratively or individually). Essentially, they had to summarize the story and express what they liked and

did not like about it. In the end, students had to write down whether they had enjoyed developing a critique and why.

Sessions 7 and 8: Monitoring Phase: Self-observation/control and attention focusing in velocity sports. In session 7 past concept images were reviewed and three new images were presented, each one depicting a different concept (attention / concentration; revising one's own work; knowing new ways of learning). Each concept was explained to the students and any questions they had were clarified. These images were then hung on the wall next to the other concept images. Two stories relating to the concepts that were discussed, as well as the topic on velocity sports, namely, car racing and cycling, were introduced to students. The activity following the reading aloud exercise focused on identifying the character's objectives and the decisions he made in order to prepare for his sport. It also focused on what that character thought he could do, as well as what he liked to do. Lastly, this activity highlighted aspects dealing with how the character concentrated and corrected his mistakes. After this activity, there was a class discussion about how the character could have done things differently and how the students could find alternative strategies to win the game. The discussion also focused on how students could find alternative strategies when they were experiencing difficulties.

In session 8 the concepts from the previous two sessions were reviewed and any questions students had were clarified. Two concepts, namely "obstacles" and "strategies" were explicitly focused on. The teachers answered students' questions and introduced a true and false activity on velocity sports, namely, car racing and cycling. This activity focused on obstacles, and on using strategies to overcome them. This exercises also focused on remembering strategies. Then, students interviewed a colleague about their interest in these sports, whether they got distracted when they practiced them and what they did in order to

concentrate. Students had to evaluate their interview together (i.e., whether it had been pronounced properly or not). Lastly, these questions were asked about their English class.

Sessions 9 and 10: Self-evaluation: Self-judgment and self-evaluation in bravery sports. In session 9 the concepts from the previous two sessions were reviewed and any questions students had were clarified. The topic on self-evaluation was introduced explicitly. Students' questions were answered. Then, two short stories on bravery sports were presented, namely, fencing and judo, which the students could choose from. The activity following the reading aloud was a multiple choice exercise focusing on identifying the character's objectives and the decisions he made in order to prepare for his sport. It also focused on whether the character thought he could do and liked to do. This activity also highlighted aspects dealing with how the character kept focused, and how he told himself to keep going. Lastly, the exercise dealt with how the character evaluated the outcomes of his combat.

In session 10 the concepts from the previous two sessions were reviewed and any questions students had were clarified. In this lesson, students were instructed to create a story, which would allow them to focus on how to approach an activity, self-motivation beliefs, attention focusing and self-instruction, and lastly, self-evaluation and causal attribution. The story had to be about two children practicing bravery sports and the steps they had to take in order to overcome difficulties and win the match, as well as how they would celebrate if they won. Lastly, students had to reflect about what they liked/ did not like about their story and their colleague's story (as they had read to each other) or, if they chose to work collaboratively, they had to proceed in the same manner, but with their partner.

Sessions 11 and 12: Self-evaluation: Self-reaction - defense/adaptive mechanisms and self-consequence in hit and kick sports. In session 11, the concepts from the previous two sessions were reviewed and students' doubts were clarified. The

teachers then introduced two stories about hit and kick sports, namely, football and tennis, which students chose to read aloud (narrate) individually or collaboratively. The post-reading activity was a multiple choice activity which reviewed all of the strategy concepts that were reviewed about how to regulate one's learning, including responsibility over outcomes, as well as the vocabulary on these sports. At the end, students spoke in an open-class discussion about how they did in the activity.

In session 12, the concepts from the previous two sessions were reviewed and students' doubts were clarified. The students then had to review the stories from the previous class and had to narrate it together with a colleague. However, before reading it again, they had to recall what had happened in the story. Then, they had to practice reading the story alone until they thought they read it fluently. Hence, they had to write down a strategy plan of what they were going to do in order to get a perfect result. After reading it, they had to evaluate whether they were ready to share with a colleague by answering questions such as: "Do I have to concentrate more?"; "Am I following my plan?"; "Do I have to ask for help?"; "Do I have to read louder?"; "Did I speak well about the sport?"; "Am I happy with my narration?"; "Do I want to read it again before showing my colleague?" The next step was to provide feedback on the narration with other colleagues. The question "What could your colleague have done differently?" guided the conversation between students.

Data Analysis of the main study

Process Data. We used responses from the three dimensions of questions (forethought, performance and self-reflection) from the diary task as our process data. Forethought, Performance and Self-reflection were measured from 1 to 5 on all items in the database. For example, 1 = "I did not plan my work in class today."; 2 = "I planned in my

class today but did not like to plan it at all"; 3 = "I liked to plan my work a little"; 4 = "I liked to plan my work enough"; and 5 = "I liked to plan my work a lot". The same process was adopted for all variables ("I found it difficult to...", "I made an effort to..." and "I was able to...") in all three blocks (forethought, performance and self-reflection). Then, the responses to the item "I found it difficult to..." were reverse scored and all of the item responses were aggregated by dimensions of planning, monitoring and self-evaluation, as indicated in the results of the exploratory factor analysis of our pilot study 1 and the confirmatory factor analysis of our pilot study 2. The aggregation was done by day so that we had a mean score of each group for each phase of the self-regulated learning cycle (each dimension) for each day of the training.

We used Multilevel Linear Modeling (IBM, SPSS, 22.0) for repeated measures designs in order to measure the difference between the experimental group and the control group concerning perceptions of how they planned, monitored and evaluated their own work throughout the ten sessions. For the analysis, a sample size of 1000 diary task entries (10 diary task entries per student) was used for each dimension (forethought, performance and self-reflection) at level 1 and of 100 students at level 2. Students were measured on ten occasions.

Each dimension (forethought, performance and self-reflection) constituted a dependent variable, whereas time and the training were considered the covariates. Data was structured at the within-person in time level (level 1) and the between person level (level 2). In terms of our hypothesis formulation, we considered, as recommended in the literature (Cleary, 2011; Zimmerman, 2000) all three dimensions (phases) as self-regulated learning activity. We used Maximum Likelihood estimation for all analyses, since it is a technique commonly used for large scale samples which provides asymptotically unbiased estimates (McCoach, 2010). Variables were introduced in SPSS in three steps so as to test the interaction effects.

Firstly, we examined the intercept-only model to determine how much variability was present in reported self-regulated learning activity at each level. This model may be represented as:

$$\Upsilon_{ti} = \pi_{0i} + \varepsilon_{ti} + u_{0i} \quad (1)$$

While the Υ_{ti} is the observed condition at time *t* for individual *i*, the π_{0i} is the intercept (average/grand-mean intercept for reported self-regulated learning activity across students). Lastly, the ε_{ti} corresponds to the variation (estimated errors) in estimating growth within individuals, while u_{0i} is the variation in estimating growth between individual. In this intercept-only model, we used a scaled identity covariance structure for the repeated measures diary task effect and a variance components covariance structure for the intercept random effect because we wanted to examine the amount of variance in the outcome within and between individuals. The scaled identity covariance structure has one estimated parameter and assumes that there is a constant variance across occasions with no correlation between components (Heck, Thomas, & Tabata, 2013).

Secondly, we focused on defining the shape of the growth trajectory. We tested a model including a quadratic time variable and another with orthogonal polynomials, which did not yield any significant results in explaining student growth in reported self-regulated learning activity. The model with linear time did, in fact, yield significant results. Hence, we opted for the linear trend. Thus, the tested model we present next includes four parameters, namely the intercept and the linear time-related variable as a fixed effect, one random intercept and one residual.

$$\Upsilon_{ti} = \beta_{00} + \beta_{10} a_{ti} + u_{0i} + \varepsilon_{ti} \quad (2)$$

In this model Υ_{ti} corresponds to the observed condition at time *t* for individual *i*, β_{00} is the intercept depicting the average initial status mean between individuals, $\beta_{10}a_{ti}$ represents the linear time-related component, u_{0i} is the level 2 random component related to describing any differences in average reported self-regulated learning activity between students, and ε_{ti} corresponds to the errors in predicting the average reported self-regulated learning activity for students. For reported forethought, performance and self-reflection activities, we used a scaled identity covariance structure for the repeated measures diary task effect, which is a simplified covariance structure with only one estimated parameter, and a variance components covariance structure for the intercept random effect (Heck et al., 2013).

Thirdly, because we wanted to understand whether the treatment (training) was related to different growth patterns, we studied any differences in development between the two groups of students. Specifically, we wanted to understand if the change was the same or different for the experimental and control in their reported self-regulated learning activity over time. In order to understand if students in the experimental group reported self-regulated learning activity over time differently from students in the control group, we combined the level 1 model with time specified as linear only to describe students' growth over time, assuming that the intercept varies between subjects and that the time slope is randomly varying. This combined model may be represented as:

$$\Upsilon_{ti} = \beta_{00} + \beta_{01}\, training_i + \beta_{10} time_{ti} + \beta_{11} time_{ti} * training_i + u_{1i} time_{ti} + u_{0i} + \varepsilon_{ti} \qquad (3)$$

Υ_{ti} is the observed condition at time *t* for individual *i*, β_{00} is the intercept showing the average initial status mean between individuals, $\beta_{01} training_i$ represents the training variable (coded 0 for no training and 1 for training), $\beta_{10} time_{ti}$ is the linear time-related component, $\beta_{11} time_{ti} * training_i$ is the interaction parameter included to examine if there are different

growth trajectories for the individuals in the two groups. Furthermore, $u_{1i}time_{ti}$ and u_{0i} are the level 2 random components related to describing any differences in average reported self-regulated learning activity between students. Lastly, ε_{ti} corresponds to the errors in predicting the average reported self-regulated learning activity for students. We used a scaled identity covariance structure for level 1 and a variance component covariance structure for level 2 of the reported forethought, performance and self-reflection activities, which are simplified covariance structures with only one estimated parameter each (Heck et al., 2013). We wanted our model to be as parsimonious as possible.

The improvement of each model over the previous one was assessed with the corresponding likelihood ratios. This difference in likelihood approximates is in accordance with the chi-square distribution (change in degrees of freedom between models: subtraction of the number of new parameters added to the model from the parameters of the previous model). Thus, we report the differences in the deviances (by subtraction) as evidence that the model with the covariates fits the data better than the model with the intercept and time, and that this latter model fits the data better than the intercept only model.

Pre-post group comparisons. We applied group pre-post comparisons in order to test the effects of the training of regulated learning with respect to the variables: students' intentions to learn, anticipations of learning outcomes and self-examination. We used students' responses from the first learning session (not the introduction sessions) to measure the pre-test and students' responses from the last learning session to measure the posttest. As mentioned in the description of the instrument, students' answers were coded in order to proceed with a quantitative analysis. Then, we tested the differences between the two groups with analysis of variance (ANOVA) with time as a repeated measurement factor. Because of pretest differences for the variable self-examination between the two groups, we also computed analyses of covariance (ANCOVA) with the pretest value as covariate. Moreover,

in order to provide a more detailed analysis as a warrant of this qualitative data (students' responses), we calculated the frequencies of the types of responses students wrote and present examples that may be seen in Appendix C. In order to test performance differences between the experimental and control group, we analyzed the mean differences from the oral task and the vocabulary task that were administered before and after the training. This was also calculated with an ANOVA using time as a repeated measurement factor.

Results

Pilot Study 1

In the exploratory factor analysis of our first pilot study, we used IBM SPSS 22.0 and FACTOR 9.2 (Lorenzo-Seva & Ferrando, 2013) to interpret the internal structure of the diary task with the data gathered from the 78 students. Table 1 shows the correlations among all variables and the descriptive statistics. All of the variables showed skewness values less than 2 and kurtosis values less than 5 as recommended by the literature (Bollen & Long, 1993). The data was tested with the Kaiser-Meyer-Olkin (KMO) and the Bartlett's Test of Sphericity for its underlying structure. The KMO measure of sampling adequacy was a reasonable .70, whereas the Bartlett Sphericity was $\chi^2_{(66)} = 1003.84$ ($p < .001$), demonstrating that the variables were suitable for factor analyses. According to Bollen and Long (1993), there is multivariate normality if Mardia's coefficient is lower than P (P + 2), where P is the number of observed variables. In this study, 12 observed variables were used with a Mardia's coefficient for skewness of 109 < 12(12 + 2) = 168 and for kurtosis of 269 > 12(12+2) = 168. Thus, considering our kurtosis values, we used Unweighted Least Squares (ULS) as the method for factor extraction, an estimation method that does not depend on distributional assumptions (Joreskog, 1977). In order to ascertain the appropriate number of factors to retain, various

factor retention criteria were applied, specifically, Velicer's MAP test and Horn Parallel analyses. We applied Velicer's MAP test and Horn Parallel analyses because they perform optimally in determining the number of factors to extract (Bandalos & Finney, 2010). By using alternative methods of extraction, we intended to propose an approximation to a simple interpretable structure (see table 4). There were no items with loadings greater than .40 on two or more components, hence, we considered all items with structure coefficients values above .30 (Bandalos & Finney, 2010; Ford, MacCallum, & Tait, 1986). Although we tested both oblique (direct oblimin) and orthogonal rotations, we opted for an orthogonal rotation, such as Varimax because we expected the factors to be independent. This preliminary study of the diary task's structure and application suggested a three factor model of forethought (α =.90), performance (α =.88), and self-reflection (α =.89), with good reliability scores according to the psychometric literature (Nunnally, 1978). What's more, the values of goodness-of-fit (*GFI* = .96), residuals statistics (*RMSR* = .09) and the Guttman-Cronbach's alpha coefficient (α = .87) were good in accordance with the literature (McDonald, 1999; Nunnally, 1978; Velicer, 1976). Hence, the items were grouped into three categories in accordance with Zimmerman's phases of self-regulated learning (2000), namely, forethought, performance and self-reflection actions that had been adopted in class by students.

Table 4

Pilot study 1 item descriptive statistics, exploratory factor analysis parameters, reliability and correlations

Variable	Structure Coefficients			*Mean (SD)*	Correlations										
	Forethought	Performance	Self-reflection		1	2	3	4	5	6	7	8	9	10	11
I liked to prepare my work.	0.99			4.36(1.27)											
I found it difficult to prepare my work.	0.45			2.18(0.73)	.498**										
I made an effort to prepare my work.	0.85			4.12(1.28)	.880**	.362**									
I was able to prepare my work	0.94			4.21(1.25)	.935**	.468**	.862**								
I liked to correct my work as I did it.		0.91		4.17(1.37)	.313**	.073	.371**	.373**							
I found it difficult to correct my work as I did it.		0.36		2.36(0.96)	.084	.402**	-.002	.078	.385**						
I made an effort to correct my work as I did it.		0.89		4.05(1.34)	.208	-.049	.355**	.286*	.825**	.335**					
I was able to correct my work as I did it		0.93		4.17(1.31)	.350**	.103	.372**	.461**	.886**	.413**	.846**				
I liked to evaluate my work			0.89	4.18(1.40)	.318**	.132	.383**	.356**	.362**	.115	.352**	.336**			
I found it difficult to evaluate my work.			0.49	2.26(0.90)	-.036	.498**	-.015	-.001	.028	.503**	.053	.040	.424**		
I made an effort to evaluate my work.			0.85	4.03(1.35)	.279*	.126	.429**	.318**	.367**	.161	.510**	.398**	.870**	.376**	
I was able to evaluate my work.			0.90	4.09(1.39)	.251*	.111	.304**	.308**	.270*	.024	.322**	.324**	.899**	.403**	.875**
Eigenvalues	4.92	1.93	1.70												
% of Explained Variance	41%	16%	14%												
Cronbach's Alpha	.90	.88	.89												

Note. †$p < 0.10$;*$p < 0.05$; **$p < 0.01$.

Pilot Study 2

For the confirmatory factor analysis of our second pilot study, we used (IBM, SPSS AMOS 19.0) estimation procedures of unweighted least squares, namely, fit indices such as chi-square, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Comparative Fit Indices (CFI), Incremental Fit Index (IFI) and Akaike Information Criterion (AIC). The CFI and IFI values close to 1 indicate a good statistical fit (Bentler, 1990), while RMSEA indicates a good fit if equal or less than .08 (Browne & Cudeck, 1993). As for the AIC, the lower the value, the better the fit. Lastly, the SRMR should be close to zero for a good fit. We tested various possible models so as to confirm the initial structure of the diary task suggested by the EFA (see table 5). We attempted to test a model with three factors and with no covariances between the items' error terms (model one); a model with four factors with no covariances (model two); a model with three factors and with covariances (model three) and a model with four factors and also with covariances (model four). For models 3 and 4, since we had identified from the students' responses during the initial development of the diary task that there were items that tapped on the same common key-processes (i.e. liking to do something, finding something difficult, making an effort and being able to accomplish something), we established covariances between the error terms of the items with the same common key-processes. Models one, two and three converged, but model four did not. From the results presented, we chose model three which presented better fit indices. According to the literature (Hooper, Coughlan, & Mullen, 2008), the three factor model we opted for presented good reference values [χ^2 (39) = 30.93, p = .818, χ^2/df = .793, CFI = 1.00, IFI = 1.04, RMSEA = .000, LO=.000, HI=.049, SRMR = .054, AIC = 108.930] in comparison with the competing models. Most of the relationships between each factor and corresponding items were higher than .5, as suggested in the literature as a good cut-off (e.g., Bandalos & Finney, 2010). All

unstandardized path coefficients were significant at $p < .05$. What's more, the construct reliability scores were higher than .80 (Hair, Black, Babin, & Anderson, 2010), while the Average Variance Extracted (AVE) scores were higher than .50, therefore supporting convergent validity (Henseler, Ringle, & Sinkovics, 2009). The variables' discriminant validity was also confirmed with all of the Average Shared Variance scores below the AVE scores (Hair et al., 2010). From these results, we maintained the structure of the diary task in accordance with Zimmerman's phases of self-regulated learning (2000) and as the EFA had initially proposed.

Table 5

Fit indices of tested models and descriptive statistics, path coefficients, Construct Reliability, Average Variance Extracted, and Average Shared Variance of Model 3

CFA Models	**$\chi 2$**	***df***	**Sig.**	**$\chi 2/df$**	**CFI**	**IFI**	**RMSEA**	**AIC**	**SRMR**
Model 1	450.0	51	.000	8.825	.616	.626	.307	528.07	.117
Model 2	388.2	48	.000	8.089	.673	.682	.292	472.27	.090
Model 3	30.93	39	.818	0.793	1.00	1.04	.000	108.93	.054
Factors		Mean (SD)			1		2	3	
1. Forethought		3.21(1.07)							
2. Performance		3.15(1.07)			.74**				
3. Self-reflection		2.99(1.14)			.52**		.37**		
Path Coefficients [Min; Max]					[.50;.91]		[.54; .94]	[.59; .91]	
CR					.88		.90	.88	
AVE					.66		.69	.66	
MSV					.58		.58	.25	
ASV					.41		.35	.18	
Cronbach's Alpha					.86		.88	.86	

Note: For the covariances between errors we followed the AMOS posttest analyses and co-varied items sharing the same content. CR = Construct Reliability; AVE = Average Variance Extracted; and ASV = Average Shared Variance.

Main study

Prior to testing our hypotheses, we computed the means, correlations and reliability coefficients of each variable (table 6).

Table 6

Descriptive statistics. Reliability coefficients. and correlations of variables for multilevel analysis

Variables	Correlations				Group	Level 1 (*N* = 1000)										Level 2 (*N* = 100)
	1	2	3	4		0	1	2	3	4	5	6	7	8	9	
1.Training		.51**	.54**	.31**		*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
2. Forethought	.34**	(.86)	.89**	.52**	EG	3.90(.71)	4.10(.65)	4.11(.62)	4.20(.41)	3.98(.77)	4.03(.76)	4.10(.68)	4.16(.45)	4.08(.67)	4.00(.83)	4.07(.34)
					CG	3.98(.66)	3.90(.64)	3.05(.84)	2.89(.95)	3.39(.75)	3.92(.95)	3.97(.58)	3.02(.91)	2.97(.95)	3.44(.76)	3.45(.58)
3. Performance	.33**	.63**	(.81)	.43**	EG	3.40(1.0)	3.85(.85)	4.13(.52)	4.16(.45)	3.91(.88)	4.01(.77)	4.17(.55)	4.23(.42)	4.12(.63)	4.20(.65)	4.01(.41)
					CG	3.97(.75)	3.37(.90)	2.95(.85)	2.98(.96)	3.33(.81)	3.88(1.0)	3.92(.61)	3.06(.88)	2.95(.94)	3.47(.69)	3.39(.25)
4. Self-reflection	.16**	.46**	.40**	(.92)	EG	3.54(1.0)	3.71(.98)	3.59(1.0)	3.67(.99)	3.34(1.0)	3.41(1.0)	3.85(.83)	3.11(1.0)	3.66(1.0)	3.80(.97)	3.57(.62)
					CG	3.80(.99)	3.63(.82)	2.90(.77)	2.79(.88)	3.07(.80)	3.63(1.1)	3.87(.73)	2.96(.88)	2.45(.56)	3.25(.81)	3.24(.40)

Note. $^{\dagger}p < 0.10$;$^{*}p < 0.05$; $^{**}p < 0.01$. EG= Experimental group; CG = Control group. Correlations below the diagonal are day level correlations (*N* = 1000). Correlations above the diagonal are person-level correlations (*N* = 100). Cronbach's alpha coefficients are reported in brackets on the diagonal. The Level 1 means and standard deviations are reported according to the time variable (from 0 to 9).

Test of Hypotheses. For hypothesis 1 we had expected that there would be different growth rates of reported self-regulated learning activity over time between the students who had experienced the training and the students who had not. Again, by self-regulated learning activity we mean forethought, performance and self-reflection activities (the three phases of Zimmerman's self-regulated learning model). Table 7 presents the model fit information (likelihood ratios) and estimates for the fixed and random effects of all three models.

At level 1, the variance corresponds to the variability in the average students' reported self-regulated learning activity estimates around their own growth trajectory (Singer & Willet, 2003). The estimates of variance for levels 1 and 2 of reported forethought activity (Z_w = 6.07, p <.001), reported performance activity (Z_w = 5.79, p <.001) and reported self-reflection activity (Z_w = 4.98, p <.001) suggest that there was sufficient variation in intercepts across students. We estimated the proportion of variance (ICC) using a one-tailed test for variances, giving us 38% of variance between individuals and 62% of variance within individuals for forethought. As for performance, we estimated 31% between individuals and 69% within individuals, while 19% between individuals and 81% within individuals for self-reflection. Thus, we concluded that there was variance within and between students' reported self-regulated learning activity over time.

Table 7

Fixed and random effects parameter estimates for models predicting reported self-regulated learning activity.

Parameter	Reported Self-regulated Learning Activity								
	Forethought			Performance			Self-reflection		
	Intercept-only	Intercept +Time	With Predictors	Intercept-only	Intercept +Time	With Predictors	Intercept-only	Intercept +Time	With Predictors
Fixed Effects									
Intercept	3.70**(.05)	3.82**(.07)	3.28**(.16)	3.64**(.05)	3.54**(.06)	3.22**(.16)	3.37**(.05)	3.52**(.07)	3.41**(.19)
Time		-0.02**(.00)	-0.09**(.02)		0.00**(.00)	-0.09**(.03)		-0.03**(.01)	-0.11**(.02)
Training			0.38**(.11)			0.26**(.11)			0.08 (.13)
TimeXTraining			0.05**(.02)			0.07**(.02)			0.06**(.02)
Random Effects									
Repeated measures	0.47**(.02)	0.47**(.02)	0.44**(.02)	0.57**(.03)	0.57**(.03)	0.53**(.02)	0.80**(.03)	0.79**(.04)	0.78**(.04)
Intercept	0.29**(.04)	0.29**(.04)	0.13**(.03)	0.26**(.04)	0.26**(.04)	0.11**(.03)	0.19**(.03)	0.19**(.04)	0.16**(.03)
Time			0.00**(00)			0.00 (.00)			0.00 (.00)
Deviance	2299.17	2286.92	2232.76	2457.97	2449.64	2383.55	2741.46	2730.81	2712.41
AIC	2305.17	2294.92	2246.76	2463.97	2457.64	2397.55	2747.46	2738.81	2726.41
BIC	2319.89	2314.55	2249.68	2478.69	2477.27	2431.90	2762.18	2758.44	2760.76

Note: Standard errors are in brackets. $^{\dagger}p < 0.10$;$^{*}p < 0.05$; $^{**}p < 0.01$. The extended values of the random effects of the Time variable in the models with predictors are .002** for forethought, .003** for performance and .0004 for self-reflection. The extended value of the fixed effect of the Time variable in the Intercept+Time model for Performance is 0.002**.

The intercept-only model, which included only the intercept, was compared to intercept + time model. The intercept + time model displayed a significant improvement over the intercept-only model (forethought: Δ *deviance* = 12.25, *df* = 1, $p < .01$; performance: Δ *deviance* = 8.33, *df* = 1, $p < .01$; self-reflection: Δ *deviance* = 10.65, *df* = 1, $p < .01$). In this second model, the intercept corresponds to the students' reported self-regulated learning activity at the beginning of the study. The linear time variable was significant in explaining student growth in reported self-regulated learning activity (forethought, performance and self-reflection).

The model containing the predictor variables and the interaction between them presented a significant improvement over the intercept + time model (forethought: Δ *deviance* = 54.16, *df* = 3, $p < .01$; performance: Δ *deviance* = 66.09, *df* = 3, $p < .05$; self-reflection: Δ *deviance* = 18.40, *df* = 3, $p < .01$). The results from this third model indicate that the students in the control group began with a mean of 3.28 for reported forethought activity, 3.22 for reported performance activity, and 3.41 for reported self-reflection activity. Results also show that there was an initial significant difference between groups for reported forethought activity and reported performance activity, as the experimental group started off with 3.66 for the first and with 3.48 for the latter. However, there was no initial significant difference between groups for reported self-reflection activity. Over each interval the scores of the control group decreased on average by -.09 points for reported forethought activity, by -.09 points for reported performance activity, and by -.11 points for reported self-reflection. Moreover, our results reveal that the experimental group decreased less than the control group. On average, the experimental group decreased by .04 for reported forethought activity (i.e. figure 11), by .02 for reported performance activity (i.e. figure 12) and by .05 for reported self-reflection activity (i.e. figure 13). As we can see in figures 11, 12 and 13, the effect of the

training (experimental group) was in reducing the negative change over time seen in the control group.

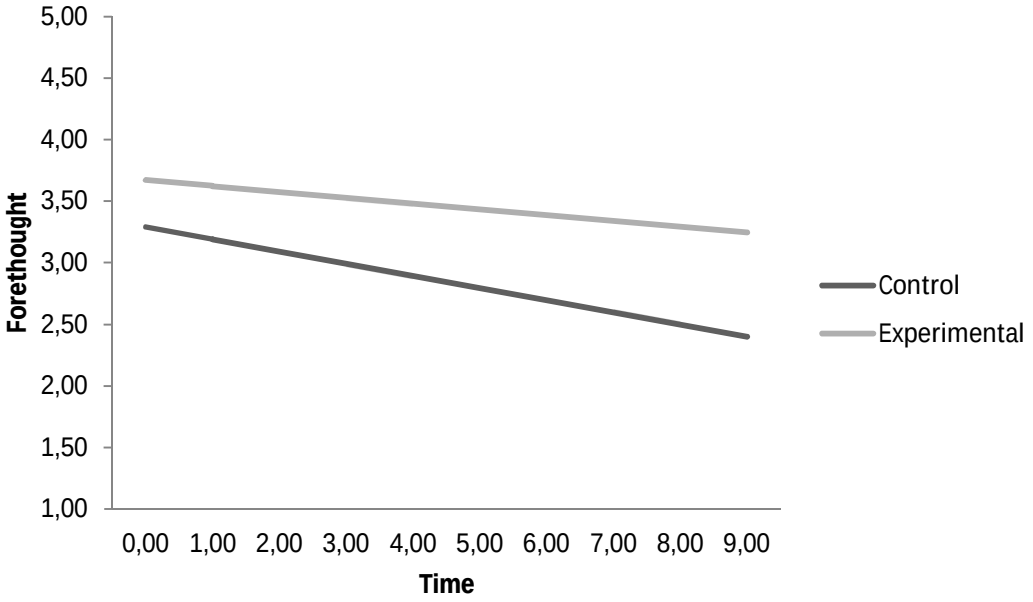


Figure 11. Fitted trajectories of the experimental and control group for reported forethought activity.

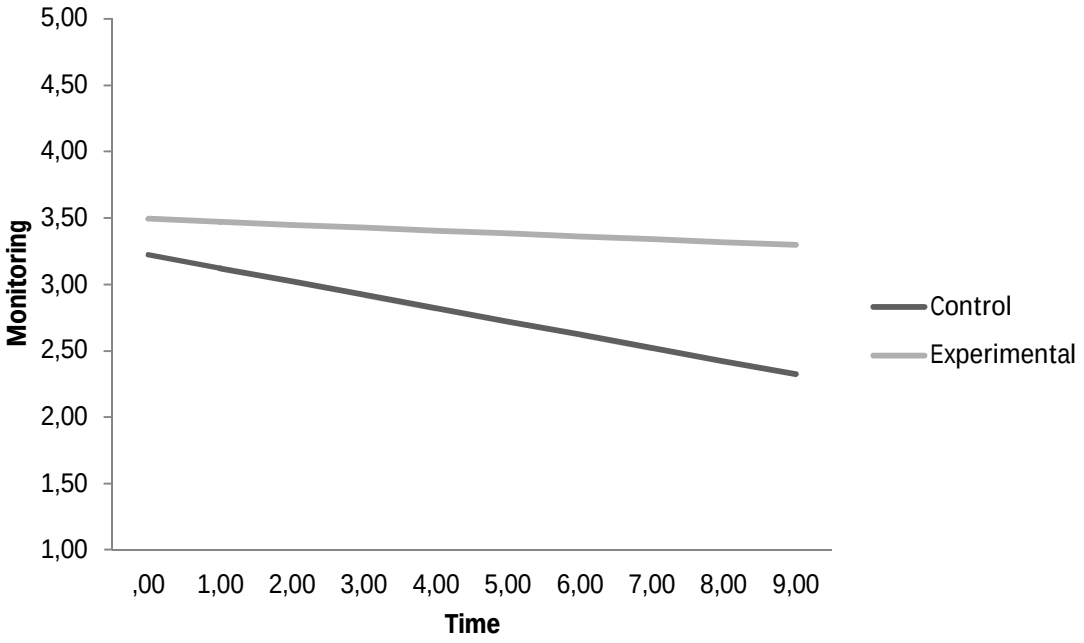


Figure 12. Fitted trajectories of the experimental and control group for reported performance activity.

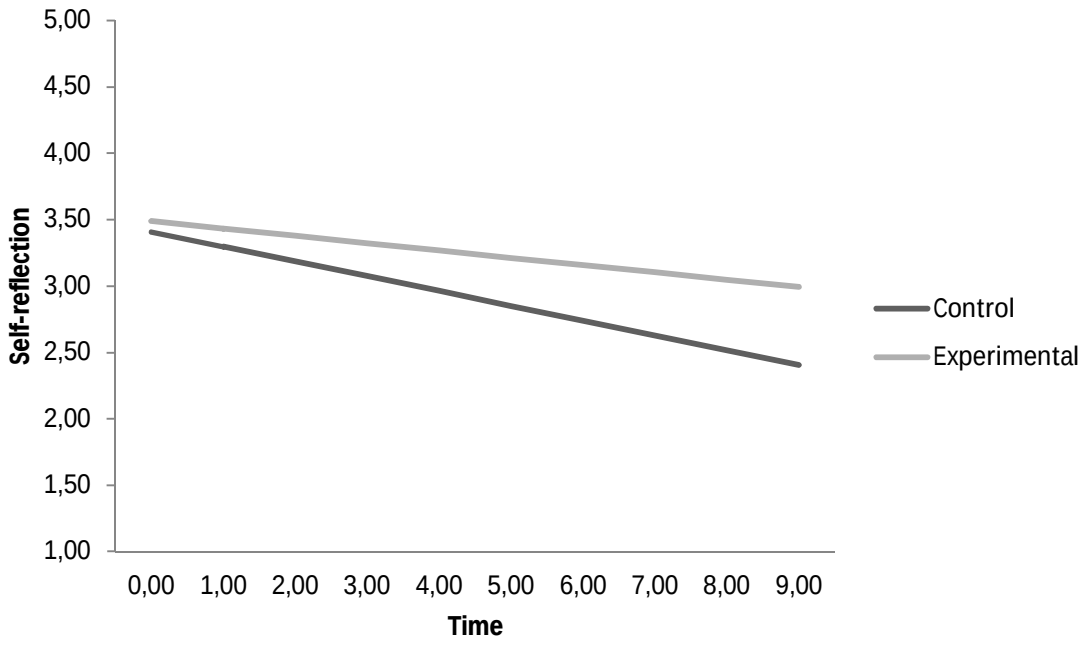


Figure 13. Fitted trajectories of the experimental and control group for reported self-reflection activity.

Furthermore, our results suggest that there were significant differences in the growth rates of reported forethought, performance and self-reflection activities over time between the two groups. That is, over each interval, there was a difference of .05 points for reported forethought, of .07 for reported performance and of .06 for reported self-reflection. In sum, while the control group significantly decreased in reported self-regulated learning activity (forethought, performance and self-reflection) the experimental group managed to decline less. Thus, we can conclude that there were different growth rates of reported self-regulated learning activity over time between students who experienced training and students who did not. (H1).

Hypothesis 2 stated that the students who experienced training in how to regulate one's learning would report their reflections more autonomously and specifically in their diary task than students who did not. There were no significant differences between the two groups

in the pretests for intentions to learn [$t(98) = -1.68$, $p > .05$], and for anticipations of learning outcomes [$t(98) = -0.19$, $p > .05$]. There were significant initial differences between the groups in the pretests for self-examination [$t(98) = -2.27$, $p < .05$]. We performed an ANCOVA for this last variable as mentioned in the method section. Table 8 shows these results, along with the means and standard deviations. In light of Cohen's (1988) distinction between small ($h_p^2 = .01$), medium ($h_p^2 = .06$) and large effects ($h_p^2 = .14$), we found medium to large effects for students' reported reflections (intentions, anticipations and self-examination).

Table 8

Means (standard deviations) and results for the interaction Time x Group regarding intentions to learn. anticipations of learning outcomes and self-examination

DV	Group	Time		*df*	*F*	h_p^2
		Pretest *M (SD)*	Posttest *M (SD)*			
Intentions	EG	4.20(1.3)	5.70(2.0)	1/98	27.75**	.22
	CG	3.66(1.6)	3.20(1.1)			
Anticipations	EG	4.47(.90)	5.83(.80)	1/98	11.54**	.11
	CG	4.43(1.1)	4.80(1.0)			
Self-examination	EG	4.10(1.6)	6.30(.60)	1/98	42.60**	.30
	CG	3.36(1.5)	3.16(1.3)			
Oral Competence	EG	1.91(.33)	3.16(.87)	1/98	65.69**	.40
	CG	1.75(.47)	1.97(.35)			
Vocabulary Competence	EG	0.53(.13)	0.62(.14)	1/98	15.36**	.14
	CG	0.52(.10)	0.51(.15)			

Note: *$p < 0.05$.. **$p < 0.01$; EG: Experimental Group; CG: Control Group. Normality assumption were tested prior to analysis and fulfilled.

The results revealed significant differences in favor of the experimental group when compared to the control group. Specifically, there was a significant interaction between time and group for students' reflections (i.e. intentions, anticipations and self-examination), having the experimental group scored significantly higher than the control group in the posttest. These results indicate that at the end of the intervention, the students in the experimental group were more autonomous and specific when they wrote about what they intended to do in class (i.e. set goals for themselves). Moreover, these results reveal that the students in the experimental group were more autonomous and specific when they wrote about what they

thought they were capable of doing in class. Lastly, these results show that the students in the experimental group were more autonomous and specific when they wrote about the what they had learned, including the appropriateness of their efforts, efficacy, thoughts and actions. Thus, hypothesis 2 was supported, confirming that students who experienced training in how to regulate one's learning reported their reflections more autonomously and specifically in their diary task than students who did not. In order to provide a detailed analysis of students' comments to the open-ended questions, we present in Appendix C estimated percentages and examples of the types of comments that students in the experimental group and in the control group wrote in their diary tasks in the pre and posttest. In agreement with the mean differences presented, these percentages showed a shift in the comments of the experimental group towards more autonomous and specific reports of their reflections.

Lastly, we hypothesized (H3) that the students who experienced the training in how to regulate one's learning would have better academic performance in EFL than students who did not. The results from an ANOVA with time as a repeated measurement factor (table 8) supported this last hypothesis. No initial significant differences were found between groups in the pretest for the oral task [$t(98) = -1.79$, $p > .05$], and for the vocabulary task [$t(98) = -0.28$, $p > .05$]. Moreover, there was a significant interaction between time and group for students' performance. The experimental group scored significantly higher in the oral task and in the vocabulary task in the posttest. Hence, the third hypothesis of this study was also confirmed, suggesting that the training in how to regulate one's learning influenced students' academic performance.

Discussion

As we have mentioned in this study, assessing students' perceptions regarding their self-regulated learning experiences in a classroom context is a difficult task which requires

measures that are process-oriented (Zimmerman 2008). This study contributes to the existing literature because it presents an instrument that goes beyond typical survey self-report measures to assess students' perceptions of their self-regulated learning processes as they happen (e.g. Azevedo & Cromley, 2004; Schmitz 2006; Schmitz et al., 2011). Following a microanalytic methodology, the diary task we used can be a highly effective approach for assessing changes in reported self-regulated learning activity and students' reflective thinking (Cleary, 2011). The diary task DOGS-RL can be proximal and specific to any determined academic task, allowing us to track students' reported self-regulated learning activity and reflective thinking throughout a training program in how to regulate one's learning. Furthermore, this study focused on a domain-area (EFL) that is not typically studied in terms of self-regulated learning processes, as recommended in the literature (Greene, Bolick, & Robertson, 2010). This study also gives its contribution to this field in the sense that it used, not only a factor analysis to determine the structure of the DOGS-RL, but also, a process analysis, as suggested in the literature (Cleary, 2011; Schmitz et al., 2011), with a multilevel analysis approach for repeated measurements as in other areas that used diary tasks to measure process data (Jett, LaPorte, & Wanchisn, 2010; Rowe, Kairalla, & McCrae, 2009; Whitty, Buchanan, Joinson, & Meredith, 2011). Moreover, the quasi-experimental pre-posttest design we used within a classroom context with primary school students and teachers allowed us to test the effects of the training in how to regulate one's learning on academic performance outcomes. What's more, this approach allowed us to validate the diary task DOGS-RL as a monitoring tool for strategic reflection and reporting and for capturing changes in the process of learning.

Our first hypothesis was confirmed with our results from the multilevel analysis of the quantitative items of the diary task. Specifically, we verified that the experimental group's growth rates of reported forethought, performance and self-reflection activities decreased

less than those of the control group. Hence, we concluded that there were different growth rates of reported self-regulated learning activity over time between students who experienced training and students who did not, allowing us to answer our first research question affirmatively. The reason why students decreased their reported self-regulated learning activity could be because, and as seen in previous studies, students of this age group may initially overestimate their metacognitive awareness of how they function in the classroom (Allwood et al., 2008; Lipko-Speed, 2013). The fact that the experimental group decreased less could be explained by some of the information the teachers provided us with in the daily meetings. In sum, the teachers believed that the students in the control group needed explicit guidance in how to regulate their learning in order to fill in the diary because they were not used to planning, monitoring and evaluating their work in class on a regular basis, or even at all in an explicit manner. These results are in accordance with previous literature (i.e., Glogger, et al., 2012; Perels, et al., 2007, Schmitz & Perels, 2011) and even meet some of the challenges regarding suggestions for future research regarding the measurement of self-regulated learning, namely with respect to changes in learners' interest, task difficulty and usefulness, and effort over a period of time (Cascallar, Boekaerts, & Costigan, 2006; Moos & Azevedo, 2008). Nonetheless, unlike most studies (i.e., Glogger, et al., 2012; Perels, et al., 2007, Schmitz & Perels, 2011), these results pertain to diary tasks that were completed in a classroom environment and not sent for homework, which allowed the teachers to help students as doubts emerged and allowed us to better witness how these diary tasks were filled in by the students, as well as how they reacted to it (i.e., doubts). This option to implement the diary task in class had to do mainly with the fact that we worked with primary school students in the fourth grade, unlike most studies that focus on older students. Having students fill in their diary tasks in class allowed us to understand any differences between classroom practices and provided our study with further ecological validity. Considering

students were from different classes with a different teacher, the varying classroom practices may have contributed to the fact that the results showed initial significant differences between groups for forethought and performance activities. What's more, in the daily meetings, teachers informed the researchers that while students were required to self-evaluate their work in general at the end of each academic period, they were not used to planning and monitoring their work in an explicit manner. This may have been one of the reasons why there were no initial significant differences between groups for reported self-reflection. Further research into this topic would be needed to fully understand the causes of the initial differences between groups in reported forethought and monitoring activities.

We also hypothesized (H2) that students who experienced training in how to regulate one's learning would report their reflections more autonomously and specifically in their diary task. A comparison between groups with an ANOVA using time as a repeated measurement factor supported this hypothesis, indicating similar findings to what has been investigated in other studies. Specifically, that students who experience training in how to regulate one's learning are autonomous and specific in reporting their reflections rather than descriptive about learning content (Perels et al., 2007; Otto, 2007; Schunk & Zimmerman, 1998; Stoeger & Ziegler, 2008; Stoeger & Ziegler, 2011; Wolters et al., 2003; Zimmerman, 2000). However, unlike most studies, we provided a detailed analysis of our qualitative data that further supports and warrants our second hypothesis. Specifically, we presented percentages of the types of comments students made, along with examples in order to illustrate exactly what students reported (Appendix C). These reports showed that in fact, the perceptions students in the experimental group reported in the open-ended questions shifted more towards strategic actions to learn than the control group in the posttest.

Our last hypothesis stated that students who experienced training in how to regulate one's learning would have better academic performance in EFL. A comparison between

groups with an ANOVA using time as a repeated measurement factor confirmed this hypothesis. These results are similar to the results from previous studies, where students who used diary tasks and experienced training in how to regulate one's learning performed better academically (Glogger et al., 2012; Otto, 2007; Perels et al., 2009). However, while most of these studies investigated training in how to regulate one's learning and diary tasks in math, we opted to contextualize our study in EFL classes, which we feel is a strength of this study because there is less research considering diary tasks and self-regulated learning in this field (Greene et al., 2010).

There could be some limitations to our study concerning internal validity issues typical of designs with repeated measurements, namely a regression threat which encompasses situations where subjects are tested several times and their scores tend to regress towards the mean. Another limitation may be a maturation threat where subjects may change during the course of the experiment. Furthermore, the fact that there were initial significant differences between the groups for reported forethought and performance activities could indicate a pre-existing advantage of the experimental group over the control group in this domain. Moreover, since students worked in different classes with different teachers, these differences could have arisen from the difference in classroom practices, which we did not control in the multilevel analysis. The fact that there was a non-random assignment of classes to treatment, could also constitute a strong limitation because we were limited to teachers' willingness to participate in the training. What's more, we studied classes from one country only. Hence, it would be interesting for future research to investigate cross-cultural differences in this area. Also, we did not consider any individual cases or individual learning sessions for analysis purposes. We could also consider examining this type of data process with time series analysis. We intend to do so in future studies, where this diary task will be

used and other aspects of students' learning process and specific characteristics of this training in how to regulate one's learning could be contemplated with other samples.

Overall, our findings are in accordance with what the literature has suggested about learners being self-regulated in the sense that they are cognitively, metacognitively, motivationally, and behaviorally active participants in their own learning process (Wolters et al., 2003; Zimmerman & Martinez-Pons, 1986). Furthermore, if we consider individual reflection regarding one's own actions and thoughts as part of metacognition, this means that metacognitive reasoning is essential for students to engage in planning, monitoring and self-reflection in class. Similar to what has been discussed in previous literature (Cleary, 2011), motivation also played a key role in students' perceptions of their planning, monitoring and self-reflection activities because of the interest they revealed throughout the sessions regarding these experiences in their responses.

Furthermore, although we only used (and only present in the Appendix section) the information from students' interviews at the end of the training as a motivational measure to illustrate how students felt about using their diary task, we posit that this step was important and is also a strength of this study. Namely because it allowed us to understand that students felt motivated to do the diary task (see Appendix B). This was an issue that we were concerned about because students had to fill in many diary tasks, which could have at some point, demotivated them, as mentioned in previous studies (Glogger, et al., 2012). An interesting direction for future research would also be to understand how students feel about completing diary tasks through applications with different time lengths and whether this has any implications on how students respond to questions in their diary tasks.

We feel that the implications of our results move towards a better understanding of how there can be change in learners' perspectives about how they regulate their learning and how this change can be measured with a diary task. Moreover, this change can also occur in

regulation itself, thus, it would be interesting to add to this diary task specific regulation activity that would measure how the learner actually regulates his/her own learning. With this in mind, research and theory should continue to focus on learners' perceptions, but increasingly from a process approach, as we have tried to demonstrate in this study. We believe that this approach is central to learning and to the regulation of learning because, as Bandura stated (2006), individuals' behaviors are influenced by external and internal factors that are in constant change. Hence, it is vital to measure this change and to understand how overt and covert influences affect learners (Zimemrman, 2000) by collecting data from the learners' perspective and from the environment. This type of assessment could aid schools and teachers in keeping a track of students' continuous development over time. This itself could have important implications for a personalization of students' evaluations in school (Cleary, 2011). What's more, if teachers have information about what their students perceive of the tasks proposed to them and of how they perform and regulate their learning in class, they can mold their pedagogical practices to fit students' needs in terms of cognitive and motivational processes.

Future studies could focus on how teachers could use their pedagogical practice to promote individual reflection about the learning process. They could themselves practice regulating their own learning, co-regulate and share regulation with colleagues in order to better guide students and teach them learning strategies explicitly. It would also be interesting to measure in future research how training in how to regulate one's learning could be designed with contemporary technological tools to promote and capture self-regulated learning processes, as well as students' perceptions about these same processes (Azevedo & Cromley, 2004). More specifically, future research could focus on computational design aspects of training in how to regulate one's learning in various curriculum-based learning environments, as recommended in previous literature (Graesser & McNamara, 2010), as well

as on an interactive and dialectic online version of the diary task DOGS-RL that could promote these processes and reflections.

Ultimately, the implications of this study are of great importance for researchers and practitioners working with elementary school children. Basically because the diary task presented here can be adopted from early on in first-grade and adapted to the different grades in primary education (i.e., substituting written form with audio form). Considering this diary-task has the potential to promote reflectiveness in students, it would be wise to start early as has been recommended in the literature (Whitebread et al., 2009). It would also be interesting to examine with a longitudinal study how children could develop their reflective thinking throughout the primary school years. Furthermore, given the importance of collaboration in learning (Järvela & Hadwin, 2013), this diary task could be used/adapted and tested as a collaborative diary task as well, where students could practice sharing goals, anticipations and reflections of their collaborative performance and regulation. This could be an opportunity for developing socially-shared regulated learning from early on.

In sum, we argue that this diary task captured change in students' perceptions regarding their experiences of planning, monitoring and evaluating their own work, as other instruments that were tested in the literature (Klug et al., 2011; Schmitz & Wiese, 2006). Teachers can use the DOGS-RL in their class with their students in order to understand how they view their self-regulated learning actions in class, which could have important implications, not only for pedagogical classroom practice, but also for how their students reflect about planning, monitoring and self-evaluating. Lastly, using learning diary tasks to capture learners' perceptions of self-regulated learning experiences as they participate in different learning environments also provides educational psychologists with an important tool/method for assessing cognitive and perceptual changes that are difficult to measure with traditional evaluation methods.

CHAPTER III

Training the regulation of learning in Computer-supported collaborative learning environments and the impact on students' learning reports and performance.

Introductory Note

> "The 21st century is characterized by the availability of abundant information, advanced technology, a rapidly changing society... Our education reform should aim at nurturing in the new generation characteristics and abilities capable of meeting the challenges of the new century."
>
> (Education Commission Hong Kong, 2003, p.4)

The third study presented in this investigation was based on the information gathered from studies one and two. In particular, we considered that students aged nine to eleven, needed guidance in becoming more aware of how they function as students. Furthermore, we took into account that both the diary task and the training in individual and collective regulated learning helped students in this age group become more reflective about their learning process and improve their performance. Hence, with these considerations, as well as the European Union's focus on the new learning competencies of the 21st century, we tried to understand how this type of instrument and training could work in a technology supported learning environment. By comparing three groups (a group with training and technology, a group with training and no technology and a group with no training), we were better able to understand how a contemporary learning environment could support changes in terms of learning and reflectiveness for students. By the results presented in this study, we were also able to understand that the technology somehow helped students learn within their social environment.

Training the regulation of learning in computer-supported collaborative learning environments and the impact on students' learning reports and performance.

Abstract

This study aimed to understand whether training in how to regulate one's learning in computer-supported collaborative learning environments and in traditional learning environments is related to students' growth patterns regarding their reported self-regulated learning activity over time. This study also examined whether this type of training has an impact on students' reflective ability and academic performance. A quasi-experimental design was used with one experimental group working in a CSCL environment and two control-groups (the first with training and no computer support, the latter with no training) with process diary data and pre and posttests (students: n = 44; diary task entries: n = 440). Results from multilevel linear analysis of the diary data showed different growth rates of reported self-regulated learning activity over time between the three groups. Pre and posttest results showed that the students experiencing training were more specific and autonomous in reporting their reflections and had better overall academic performance. Implications for practitioners and suggestions for future research are discussed.

Key-words: Regulation of Learning, Computer-supported Collaborative Learning Environments, Agency, Multilevel Analysis

Introduction

Understanding how learners manage their learning with the advances of modern technology in today's classrooms is an ongoing focus of contemporary research. The informational and technological developments provide learners with immediate access to information and increasing opportunities to regulate learning at any time and in any place. By using digital resources, learners are able to take control of their learning process in an autonomous manner. Thus, learners' conceptions of learning should be reoriented, as they are agents of their learning, rather than information receivers (Bandura, 2006). Therefore, regulation of learning is imperative in order to shape learners into metacognitively skillful self-regulators, capable of strategic development in different content domains (Zimmerman, 2008).

There is an increasing need for research to focus on investigating the regulation of learning in multimedia instruction because it is still not fully explored in terms of its potential to support and register how learners learn and regulate their learning (Azevedo & Cromley, 2004; Zimmerman, 2013). Accordingly, studying learners' perceptions of their own regulation of learning is also becoming more important because they contribute to how learning is approached (Joo, Bong, & Choi, 2000). Furthermore, recent research has indicated that the processes involved in regulating learning must be further studied with both self-reports and digital traces of learners' actions so that it may be possible to examine the relationship between learners' reflections and actual performance indicators (Azevedo & Cromley, 2004; Järvelä et al., 2012). In line with these research needs, some authors have argued that educational technology has increasing advantages if social interaction is contemplated in order to improve student learning (Meltzoff, Kuhl, Movellan, & Sejnowski, 2009). Roschelle (2013) mentioned that the use and effects of CSCL in different domains may have different, yet important implications for learning and that more research should focus on this issue.

With these research needs in mind, this study aimed to investigate whether training in how to regulate one's learning in CSCL environments and traditional learning environments could influence students' growth patterns of their reported self-regulated learning activity over time, their ability to reflect about their own functioning in class, and their academic performance. In particular, we propose to answer the following questions:

Are there differences in growth rates of reported self-regulated learning activity over time between students who experience training in a CSCL environment and students who do not?

Do students who experience training in a CSCL environment report their reflections more autonomously and specifically in their diary task than students who do not?

Do students who experience training in a CSCL environment have better academic performance than students who do not?

In accordance with Zimmerman's model of self-regulated learning (2000) and with Bandura's theory of Human Agency (2006), we use the term reported self-regulated learning activity when we refer to students as self-regulators. That is, once students adopt intentions and action plans, they build a course of action, motivate and regulate their execution (self-regulated learning activity), connecting thought and action. Thus, students in this study reported their self-reactions about their self-regulated learning activity in class. Moreover, we use the term reflective ability (i.e. reported intentions to learn, reported anticipations of learning outcomes and reported self-examination) to refer to students as planners with a deliberate capacity to make choices and set goals, as forethinkers who anticipate outcomes of prospective actions, and as self-examiners who have the metacognitive capability to examine their own functioning by reflecting on their own efficacy, appropriateness of thoughts and actions, as well as on the value of their own efforts (Bandura, 2006; Zimmerman, 2000).

Later, this study also examined whether there was a relationship between students' ongoing performance and their reported self-regulated learning activity. We use the term regulation of learning as opposed to self-regulated learning because, as we mention further in the next sections, this study focused on a collaborative learning environment, where students had the opportunity to self-regulate, co-regulate and share the regulation of learning (Järvelä & Hadwin, 2013; Määttä et al., 2012). In accordance, we use the term self-regulated learning when we refer to students' reports and reflections of their own functioning. Lastly, we use the term traditional learning environments to refer to learning contexts where a computer was not used.

Learners as Agents in the regulation of Learning

Regulation is considered in the literature as a systematic and dynamic process of human behavior, involving the establishment of personal goals, as well as the will to reach those goals (Zeidner, Boekaerts, & Pintrich, 2000; Zimmerman, 2011). Specifically, Zimmerman (1989) defined self-regulated learning as being the extent to which learners are motivationally, metacognitively and behaviourally active agents of their own learning process. Hence, learners have different degrees of agentically steering their learning by self-organizing, being proactive, self-regulating, and self-reflecting. That is, when learners contribute to their learning process, rather than concentrating on the products of learning, they are agents of that learning process (Bandura, 2006). This is the operational definition of the regulation of learning used in this study.

Being an agent of one's own learning process involves intentionality, forethought, self-reactiveness and self-reflectiveness. According to the literature, these properties of human agency go hand-in-hand with the regulation of learning (Bandura, 2006; Zimmerman & Schunk, 2003). Firstly, in the regulation of learning, learners form intentions that include

action plans and strategies to accomplish them. Secondly, learners forethink by deliberately visualizing goals, anticipating possible outcomes of future actions through cognitive representations that direct and motivate efforts to learn. Thirdly, learners self-react by constructing a sequence of actions, and by motivating and regulating the performance of those actions. Lastly, learners self-reflect by examining their own functioning through metacognitive reflection of thoughts and actions.

In this study, we consider this conceptualization of human agency as an operationalization of how learners regulate learning within their surrounding environment through the various phases of the cyclical model of self-regulated learning proposed by Zimmerman (2000). Specifically, in the forethought phase, the author proposed that learners go through task analysis and self-motivation belief processes in order to prepare for their efforts to learn. Accordingly, learners agentically form intentions to learn and anticipate learning outcomes. In the performance phase, the author suggested that learners employ self-control and self-monitoring processes to their own performance during efforts to learn. It is in this manner of tracing and guiding courses of action that learners self-react to their intentions to learn and anticipations of learning outcomes. Lastly, in the self-reflection phase, the author stated that learners react to their performance outcomes after efforts to learn. In agreement with the human agency theory proposed by Bandura (2006), it is at this point that learners examine their own functioning throughout the entire online regulation of the task (Efklides, 2011), a process which, according to Zimmerman (2013), influences prospective forethought processes in future efforts to learn.

Evidence of children's regulation of learning in computer-supported learning environments

Some studies have demonstrated how using technology with elementary school children can be beneficial in terms of getting them to agentically steer their learning process (Dressel & Haugwitz, 2008; Ladel, 2006). Over the past years, research has focused on what it is about technology that could have an impact on young learners, encompassing perceptions of internal and external variables that could affect learning, as well as strategic action, motivational and metacognitive aspects, social interaction and domain-specific academic performance. Other studies have focused on how technology can be used by researchers to capture the learning process as it happens without interrupting learners. In this section, we present an overview of some of the recent literature that has focused on these issues as starting points for our research.

Regarding learners' perceptions, Geer and Sweeney (2012) for example, considered these important and explored how primary school children perceived a learning environment that could best aid them in learning more efficiently and agentically. Through focus groups, questionnaires and drawings, the authors identified technologies, strategies and settings as learning aids mentioned by the students. Geer and Sweeney found that students felt engaged and expected to use technological tools to enhance their understanding of concepts and to produce professional-looking work by being provided with immediate access to a multiplicity of information and tools that allowed them to perceive learning as more enjoyable. What's more, the students in this study mentioned how computer-supported environments also allowed them to work more collaboratively with colleagues. Furthermore, the findings of Geer and Sweeney suggested that students also considered teachers as important elements that could serve as learning models and could design meaningful learning tasks in computer-supported environments, as long as they were familiar with the technology.

Geer and Sweeney (2012) demonstrated how children considered enjoying learning as an important aspect of using technology and hence, learning tools should foster motivated learning at an individual level and should provide opportunities for social and interactive learning (Azevedo, 2005). In accordance, Järvelä and her colleagues (2012) studied how primary school students' motivation was related to the regulation of learning in a computer-supported science classroom (i.e. gStudy Software). The gStudy Software and the respective trace data were used to investigate the role of motivation in the regulation of learning. Additionally, through a motivation scaffold sheet, trace data and interviews, the authors identified and analyzed students' situated motivation during efforts to learn, how their different motivational approaches triggered cognitive regulation, and their perceived motivational regulation during the learning process. The authors found that students' regulation strategies differed qualitatively depending on whether they had high or low motivation in the same computer-supported learning environment. Specifically, students' situational motivation varied depending on the learning situation. In addition, the high and low-motivated groups were not different in terms of type of activity (i.e. choosing actions, duration of actions, etc..), but rather in terms of whether and how this activity was conducted repeatedly in the same manner. For example, the high-motivated students explored the variety of tactics they use more than the low-motivated group. Accordingly, the high motivated students were also more active in expressing how they self-regulated their learning. Hence, the authors concluded that motivation was related to the regulation of learning as it occurred in this context.

Similarly, Pacheco (2013) worked with third grade students to investigate how a constructive and collaborative learning approach and the use of a computer-supported learning environment could improve the level of motivation, as well as social involvement and discussion, and academic performance in math. Since many individual goals involve the

participation of other agents, learners must adapt their self-interests in order to obtain collaboration of efforts (Bandura, 2006) Hence, collective actions resulting in effective collaborative performance entail collective intentionality. Therefore, the way in which a learning environment is designed is important in order to foster collaboration. According to some authors, this type of environment which is designed to promote collaborative learning, is considered a CSCL. Specifically, Kirschner and Gijsbert (2013) explained how CSCL involves learning (thereby implicating pedagogy) collectively (hence being social) with the aid of networked computers (thus requiring technology). Pacheco (2013) used a case-study approach with the use of interviews and students' work. The findings from this study revealed that the integration of technology into students' conventional classes fostered opportunities to improve students' motivation, collaboration and discussion primarily because of their exploratory experiences in learning. What's more, the author also reported evidence that by incorporating interactive tools in simulated environments, students improved their academic performance in math. Lastly, Pacheco suggested that more research should be conducted on collaborative learning and the use of technology in classes, but through experimental approaches.

In line with Pacheco's research (2013), Järvelä, Hurme and Järvenoja (2011) mentioned that independently of the use of technology tools, effective and motivated learning within collaborative learning environments requires that learners self-regulate learning. Consistent with this standpoint, Dangwal and Thounaojam (2011) examined how 8 to 14 year-old children learned in a computer-supported learning environment, namely through Minimally Invasive Education (MIE) Learning Stations. The authors intended to measure and monitor how children developed self-regulated learning traits with the use of diary tasks (written by the children), observations and feedback given by children. Inclusively, Dangwal and Thounaojam tried to observe how self-observation, self-judgment and self-reaction

interacted as a basis for self-regulatory behavior. The authors found that children seem to self-regulate and construct their own learning even in computer-supported environments where learning is not induced. Specifically, children learned through trial and error, rehearsal, self-discovery and practice and drilling on a computer, exhibiting actions that were controlled by their ability to self-regulate and thus, were able to regulate their efforts and persist in tasks. These children also demonstrated how they selected and created their social environment which allowed them to learn more efficiently and enjoyably, and hence, be motivated to learn.

Perry, Thauberger and Hutchinson (2010) also studied children's (1st grade) regulation of learning and performance in a computer-supported learning environment (gStudy). These authors wanted to investigate what the children had understood of the topic (i..e. two texts regarding a frog's life cycle), how they had self-regulated their learning while studying with the information system, and how their regulation of learning was related to their understanding of the topic. The authors used data sources that included the children's academic achievement and level of motivation according to the teachers; the information system's traces during the reading activity, such as exploration and monitoring option buttons, accessing the Dictionary, observation logs, questions and predictions; as well as self-evaluation templates, and concept maps. The authors found that most of the participating children attained a high level of understanding regarding the concepts that were presented in the texts. Furthermore, digital traces revealed that the children engaged in the regulation of learning, such as monitoring and constructing comprehension during reading, asking questions and making predictions after reading, and evaluating learning. Lastly, the children's online regulation of learning was positively associated with their achievement in the tasks. Limitations of this study included for the most part, the lack of a baseline task on the content in order to test what children learned, as well as the lack of teacher and peer support during

the tasks. Ultimately, these authors recommend that further research focus on experimental studies that shed light on how instruction and scaffolding influences children's learning and regulation of learning in multimedia contexts.

Following Perry and colleagues' proposal (2010), this paper presents a quasi-experimental study where the benefits of technology are taken into account as in other studies (Dressel & Haugwitz, 2008; Ladel, 2006; Meltzoff et al., 2009; Roschelle, 2013) considering the perspective of the students and their ongoing performance, as some authors suggest (Azevedo & Cromley, 2004; Geer & Sweeney, 2012; Järvelä et al, 2012; Joo et al, 2000), to understand how certain processes of the regulation of learning develop, as recommended in previous studies (Järvelä et al., 2011). Unlike these studies however, we aimed to investigate differences between three groups of students (i.e. experimental group, control group 1 and control group 2). Thus, and in agreement with the aims of this study, we hypothesize that:

H1: There are different growth rates of reported self-regulated learning activity over time between students who experience training in CSCL environments and students who do not.

H2: Students who experience training in CSCL environments report their reflections more autonomously and specifically in their diary task than students who do not.

Specifically in language learning, technology has been a widely accepted tool over the years, from audiovisual resources to multimedia learning with learning management systems which present new opportunities for communicative and authentic language activities (Sanchez-Villalon et al., 2010). In a meta-analysis, Dixon and colleagues (2012) argued how the best conditions for acquiring a foreign language varied, depending on the learners' characteristics, learning contexts, learning goals, curriculum and the interaction between these variables. For example, with a quasi-experimental study, Proctor and colleagues (2011)

investigated how fifth-grade English speaking and Spanish-English speaking students learned 40 new vocabulary words from an intervention with eight multimedia texts (in English and in Spanish) in a computer-supported learning environment (ICON - Improving Comprehension Online). The experimental group read the texts with embedded instruction and reading strategy support. This group outperformed the control group (in regular curriculum classes) in terms of vocabulary knowledge and depth of word knowledge.

Acha (2009) also studied how children's vocabulary learning (3th and 4th grade) with a self-guided multimedia program could be affected differently, depending on the presentation mode of the vocabulary. She tested how children would recall 12 new vocabulary words in a story in English that were presented either with written translation, pictures representing the meaning of the word, or both. The author discovered that children performed better if they only received the written translation. In essence, this would bring forth important implications for the design of multimedia programs for children based on the regulation of learning, which will be considered in the method section of this study. Moreover, in our study, we also wanted to investigate any effects on academic performance, such as other authors (e.g. Pacheco, 2013) and as mentioned in the aims of this study, we propose that:

H3: Students who experience training in a CSCL environment will have better overall academic performance in EFL than students who do not.

Method

Study design

A quasi-experimental design was used with one experimental group and two control-groups with process diary task data and pre and posttests gathered in an authentic context from all groups (Klug et al., 2011). The experimental group experienced 12 lessons with training in how to regulate one's learning in a CSCL environment (two of which were introduction lessons to the *Moodle* platform, its content: i.e. characters and self-regulation,

and the diary task), while control group 1 experienced 12 lessons with training in how to regulate one's learning, but with no technological support (two of which were introduction lessons to the methodology, the content: characters and self-regulation, and the diary task). Control group 2 had their regular EFL classes during the 12 lessons where they filled out the diary (two of which were introduction lessons to the diary task). All three groups filled in diary tasks. The process data allowed us to monitor any changes occurring over time in terms of the practice effects of the training in how to regulate one's learning on our participants, and make statistical inferences concerning the results obtained (Schmitz & Wiese, 2006).

Participants

A convenience sample of 44 EFL students (*M* = 9.1 years, *SD* = .34, 54.5% girls) participated in this study. All participating students were in the fourth grade of two different schools in the Lisbon area. All were in the same level of EFL (A1 level – basic user) according to their teacher's indications of the Common European Framework of Reference for Languages guidelines (Council of Europe, 2011). Also, all students were of middle class families (86.4% Portuguese and 13.6% Brazilian), and all spoke Portuguese fluently. A total of 14 students were in the experimental group, 16 students to control group 1, and 14 students to control group 2. We opted to use two control groups as suggested in the literature (Schmitz & Perels, 2011) because this enabled us to control general training aspects, such as computer use, as well as any Hawthorne effects (Schmitz & Wiese, 2006). Furthermore, by introducing a third group, we were able to study whether the teaching procedures (with and without technology) would have any kind of impact on the students' learning development in terms of regulation and task improvement because all three groups completed a learning diary task. All three groups had the same teacher to control for differences in teaching practices.

Instruments

DOGS-RL. The structure of the Diary of Guided Self-regulated Learning - DOGS-RL (see Ferreira, Veiga Simão, & Lopes da Silva, in press-a) for children is based on Bandura's (2006) theory of agency of intentionality, forethought, self-reactiveness and self-reflectiveness, as well as on Zimmerman's (2000) three phase model of self-regulated learning (forethought, performance and self-reflection). It includes two open-ended questions that should be responded before a learning task or class (about intentions to learn coded on a scale of 9 points from 1 = irrelevant comments to 9 = specific and autonomous goal regarding strategic action , "Today in my class I want to learn..."; and anticipations of learning outcomes coded on a scale of 7 points from 1 = irrelevant comments to 7 = specific anticipation regarding strategic action "Today in my class I will be able to..."), one quantitative scale-type section about self-regulated learning activity in accordance with Zimmerman's three phase model (forethought: α =.80, performance: α.=.90 and self-reflection: α.=.88) that should be responded at the end of a task or class individually (i.e. Did I plan my work in class?" on the basis of "No" scored at 0, or "Yes, I liked to plan my work.." scaled at 1 = "not at all"; 2 = "a little"; 3 = "enough"; 4 = "a lot"), and a final open-ended question (self-reflection coded on a scale of 7 points from 1 = irrelevant comments to 7 = specific cognitive and/or affective self-reflection regarding strategic action, "Today I learned...") that should be responded also at the end of a task or class individually (see Appendix D). Evidence has shown that monitoring one's actions during the process of learning may result in lower performance levels and lower efficiency in complex tasks (Van Gog, Kester, & Paas, 2011). Hence, this instrument is not to be fill in while students are engaged in efforts to learn, but rather, immediately after.

Oral Task about Sports. The oral task (α = .84) that we used was online and included 10 items (pictures), where students had to describe in English what they saw in the 10 different pictures about sports. Students were rated from 1 to 5 on the basis of whether they said no words (1), non-related words (2), related words (3), related sentences with mistakes (4), and related sentences with no mistakes (5). This measure was developed according to the content from the national curriculum of EFL for primary education and with the help of two primary school teachers. Its facial and content validity was tested by interviewing two other teachers regarding specific content-related questions (i.e. "What does the task assess?"; "What's the objective of the task?"; and "Do you think it is fit for these students... if not, make suggestions.").

Vocabulary Task about Sports. The online vocabulary task (α = .85) was composed of 33 items in English pertaining to vocabulary about sports. Students had to identify sports objects in the pictures and were scored dichotomously on whether they got the answer correct or incorrect. The students' responses were registered online. The procedures of its development and facial and content validity were identical to those of the oral task.

Procedures

Ethical Aspects. The participants in this study (students and teacher) were all informed of the ethical standards by which this study abided, including anonymity and volunteerism. The teacher was also informed beforehand that all students would be able to experience the training of the experimental condition once the study was completed.

Management of participating groups. As mentioned, this study used a convenience sample, but the condition of the three groups of students (i.e. experimental, control group 1 and control group 2) was randomly assigned by the researchers. The initial equivalence between groups was tested with students' grade-point average in EFL class and with the CATOM (Children's Awareness Tool of Metacognition, see Ferreira, Veiga Simão, & Lopes da Silva, in press-b) to test for metacognitive awareness. No significant differences were found between the three groups.

All three groups completed a learning diary task (DOGS-RL) for and about each of the lessons they experienced. The 14 students in the experimental group, the 16 in control group 1 and the 14 in control group 2 filled in a total of 12 diary tasks each (including the introductory lessons to the *Moodle* platform). Also, all three groups had to practice using the diary task in the first two lessons. Students were informed that they were going to fill in this diary task at the beginning and end of each lesson pertaining to the entire lesson they had had. Lastly, each group completed an online oral task and an online vocabulary task before and after the lessons that served as pre and posttest measures of overall academic performance.

In order to better understand the different occurrences in the experimental condition, as well as the students' reactions to the lessons, video recordings and observations were done by one researcher to the experimental group. Students in this group were interviewed about their practice with computers at home. None of the students used a computer at home, either because they were not allowed to or because there was no computer available. Nonetheless, they all had Information and communication technology classes (experience of 3 years) at school and were all familiar in using this resource.

Teacher participation. The teacher gave classes to all three groups. She was informed about how the diary task should be filled in, as well as how this instrument may bring advantages (i.e. awareness of strategic action) and disadvantages (i.e. students getting tired of filling in the diaries) as suggested in the literature (Glogger et al., 2012). Furthermore, she had prior preparation regarding the concept of how to regulate learning and collaborative learning (Järvelä et al., 2011). She was introduced to Zimmerman's (2000) model of self-regulated learning and to the strategies presented in Zimmerman and Martinez-Pons' (1986) study. These studies were discussed with the teacher. The teacher also participated in a workshop where she shared with the researchers how she regulated her own learning and whether and how she usually taught learning strategies to her students. Throughout the intervention, the teacher had a brief meeting with one of the researchers regarding each of the lessons given to the experimental group and to control group 1 in order to express her perception of how the lessons progressed and how the students reacted. The teacher also referred to the use of the diary task by control group 2 and how this group reacted to this instrument.

Training in how to regulate learning and learning resources of the experimental condition. Each student of the experimental group used an individual computer (Intel Core Processor; Labtec keyboard; LG 40 inch screen; Labtec mouse and mouse pad) and a set of headphones and microphone (Grimtec indus g05) to work in class. In collaborative activities, they shared these resources.

The experimental group experienced a twelve-lesson training period on how to regulate learning in a CSCL environment that included the pedagogical use of digital animation and Moodle. In terms of content, students practiced using the English language in the didactic unit

about sports, as indicated by the national programs of EFL learning in primary education. The two initial lessons (lessons 1 and 2) served as introductory lessons to the platform. The digital animation included small (i.e. approximately 3 minutes) sketches with characters (i.e. Bernard Bear) practicing sports and modeling regulation strategies. Authorization to use these sketches in the study was requested and granted by the digital animation company that created the sketches. We included animations, rather than only static pictures because evidence has shown that the first have potential and may be effective in instructional design of learning technology (Hoffler & Leutner, 2007). Each sketch had three versions, namely, one with a native English speaker narrating the video so students could listen to the story and with subtitles so they could read it simultaneously; another with the subtitles, but without the narrator, so they could practice their own narration; and a third one without the narrator and without subtitles in case they chose to narrate the story without audio and written aids. These options were given to the students to provide them with personalized learning opportunities in order to be successful (Acha, 2009). The remaining activities were all based on these sketches. For example, students could choose certain exercises to do (i.e. which video to see) and whether they wanted to work alone or with a colleague (i.e. type out a plan to help the characters in the story practice a certain sport better). They could also redo exercises if they chose to by monitoring and evaluating their progress with the help of feedback given by the platform, the colleagues or the teacher. This allowed students to correct their mistakes immediately if they decided to do so. Furthermore, all students had access to the glossary throughout the lessons and could consult it or add words and definitions to it as they seemed necessary. All of the prompts and instructions were provided to students in both English and Portuguese as recommended by the national primary education curriculum of EFL in Portugal. All content-related texts were presented in English only. Students also experienced explicit teaching of learning strategies, guidance, reminders, encouragement and modeling

provided by the characters on the platform and by the teacher. This regulation of learning occurred while they worked on EFL content with activities such as, vocabulary exercises (i.e. multiple-choice questions); speaking exercises (i.e. responding to interview questions and video drills); listening exercises (i.e. listening to the narrator of the videos and to colleagues during interviews); written exercises (i.e. responding to open-ended questions regarding the character's strategies to achieve an objective); and reading exercises (i.e. reading subtitles of videos and definitions of words, instructions, etc…). Due to space limitations, we only provide the topics and the objectives of the lessons next. A lengthier description of the observed lessons may be found in Appendix E. Some common objectives to all lessons included: to fill in a personal diary about own learning process during each lesson; to engage in multimedia study; to engage in individual and collaborative work as needed; to use the target language; and to apply the vocabulary related to the topic.

Lessons 1 and 2. Topic: Introduction to the CSCL environment**.** Objectives: At the end of these lessons, students will be able to use the *Moodle* platform.

Lessons 3 and 4. Topic: Strategic planning and setting objectives to practice water sports. Objectives: At the end of these lessons, students will be able to anticipate the video's theme; practice reading, listening and writing skills; identify different water sports, namely, canoeing and swimming; identify objectives; prepare their work; be aware of and follow the teacher's instructions; ascertain what he/she has learned in this lesson.

Lessons 5 and 6. Topic: Self-motivation/efficacy beliefs and task interest in indoor sports. Objectives: At the end of these lessons, students will be able to anticipate the video's theme; practice reading, listening and writing skills; identify different indoor sports, namely, basketball and ping pong; identify objectives; prepare their work; be aware of and follow the teacher's instructions; use like and dislike; grasp the concept of the importance of finishing their work; ascertain what he/she has learned in this lesson.

Lessons 7 and 8. Topic: Self-observation/control and attention focusing in velocity sports. Objectives: At the end of these lessons, students will be able to anticipate the video's theme; practice reading, listening and writing skills; identify different velocity sports, namely, car racing and cycling; identify objectives; prepare their work; be aware of and follow the teacher's instructions; use like and dislike; grasp the concept of the importance of finishing their work; focus on their attention; rectify their work; identify obstacles: identify different ways of learning; ascertain what he/she has learned in this lesson.

Lessons 9 and 10. Topic: Self-judgment and evaluation in bravery sports***.*** Objectives: At the end of these lessons, students will be able to anticipate the video's theme; practice reading, listening and writing skills; identify different bravery sports, namely, fencing and judo; identify objectives; prepare their work; be aware of and follow the teacher's instructions; use like and dislike; grasp the concept of the importance of finishing their work; focus on their attention; rectify their work; identify obstacles; identify different ways of learning/ strategies; evaluate their own work; ascertain what he/she has learned in this lesson.

Lessons 11 and 12. Topic: Self-reaction and defense/adaptive mechanisms in hit and kick sports. Objectives: At the end of these lessons, students will be able to anticipate the video's theme; practice reading, listening and writing skills; identify different bravery sports, namely, fencing and judo; use the target language; apply some vocabulary related to the topic; identify objectives; prepare their work; be aware of and follow the teacher's instructions; use like and dislike; grasp the concept of the importance of finishing their work; focus on their attention; rectify their work; identify obstacles; identify different ways of learning/ strategies; evaluate their own work; ascertain what he/she has learned in this lesson.

Control group 1 in an alternative intervention. The first control group experienced an alternative training to that of the experimental group. To be exact, this group had the same teaching procedures (including training in how to regulate one's learning) and content material as the experimental group, except no technological resources were used. Rather, all of the learning material was on paper (i.e. comics presenting the video sketches).

Control group 2 with no intervention. This second control group experienced no intervention in terms of teaching procedures. The group had their regular EFL classes on the same topic as the other groups (sports). So as to control for any influences from the training on the teacher's teaching practices, this group filled in their diaries prior to the experimental group and control group 1.

Data analysis

Process Data. Our process data included students' quantitative responses about their reported self-regulated learning activity (dependent variables: forethought, performance and self-reflection) from 10 diary tasks (not including the first introductory lessons). Students' reported self-regulated learning activity was measured from 1 to 5 on all items in the database. For example, 1 = "I did not correct my work as I did it in class today.", 2 = "I corrected my work as I did it in class today but I did not like to correct it at all", 3 = "I liked to correct my work a little as I did it in class today", 4 = "I liked to correct my work enough as I did it in class today", and 5 = "I liked to correct my work a lot as I did it in class today". The same process was adopted for all variables ("I found it difficult to...", "I made an effort to..." and "I was able to...") of self-regulated learning activity (i.e. forethought, performance and self-reflection). Then, the responses to the item "I found it difficult to..." were reverse scored and all of the item responses were aggregated by dimensions of planning, monitoring and self-evaluation, as indicated in previous studies about the diary task DOGS-RL (Ferreira et al., in press-a). We checked previously for individual person reliability on IBM SPSS 22.0. All

participants in the study had good reliability above .70. We also checked for similar trajectories among participants in order to aggregated the data across participants accordingly.

In order to examine whether there were differences in the growth rates of students' reported self-regulated learning activity over time (H1), we performed Multilevel Linear Modeling (IBM, SPSS, 22.0) for repeated measures designs in order to study the difference between the experimental group and the two control groups regarding their perceptions of how they planned, monitored and evaluated their own work throughout the lessons (reported self-regulated learning). For this analysis, a sample size of 440 diary task entries (10 diary task entries per student) was used for each dimension (forethought, performance and self-reflection) at level 1 and of 44 students at level 2. Students were measured on ten occasions.

Each of these dimensions constituted a dependent variable, whereas time and the training were considered the independent variables. We structured the data at the within-person in time level (level 1) and the between person level (level 2). In terms of our hypothesis formulation, we considered all three dimensions (phases) as self-regulated learning activity, as suggested in the literature (Cleary, 2011; Zimmerman, 2000). We used Maximum Likelihood estimation for all analyses, considering it is a technique commonly used for large scale samples which provides asymptotically unbiased estimates (McCoach, 2010). In order to test the interaction effects, we introduced the variables in three steps on SPSS.

Firstly, we computed the intercept-only model for each dimension separately (i.e. model 1 containing no explanatory variable). This model may be represented as:

$$\Upsilon_{ti} = \pi_{0i} + \varepsilon_{ti} + u_{0i} \quad (1)$$

The Υ_{ti} is the observed condition at time *t* for individual *i*, whereas the π_{0i} is the intercept (average/grand-mean intercept for reported self-regulated learning activity across

students). Lastly, the ε_{ti} refers to the variation (estimated errors) in estimating growth within individuals, whereas u_{0i} is the variation in estimating growth between individual. We used a scaled identity covariance structure for the repeated measures diary task effect and a variance components covariance structure for the intercept random effect in this intercept-only model because we wanted to examine the amount of variance in the outcome within and between individuals. According to the literature, the scaled identity covariance structure contains one estimated parameter and assumes that there is a constant variance across occasions with no correlation between components (Heck et al., 2013).

In a second step, we focused on explaining the shape of the growth trajectory. Hence, we tested a model including a quadratic time variable and another with orthogonal polynomials, which did not yield any significant results in explaining student growth in reported forethought and self-reflection activities. The model with linear time did, in fact, yield significant results for forethought and self-reflection activities. Nonetheless, we found a significant result for quadratic time in explaining student growth in reported performance activity. Hence, we opted for a linear trend for the forethought and self-reflection dimensions, and for a quadratic trend for the performance dimension. Thus, the tested model we present next for the forethought and self-reflection dimensions includes four parameters, namely the intercept and the linear time-related variable as a fixed effect, one random intercept and one residual.

$$\Upsilon_{ti} = \beta_{00} + \beta_{10} a_{ti} + u_{0i} + \varepsilon_{ti} \quad (2)$$

The model we present for the performance dimension includes an extra parameter, which pertains to quadratic time. Therefore, the model for reported performance activity may be represented as:

$$\Upsilon_{ti} = \beta_{00} + \beta_{10} a_{ti} + \beta_{20} a^2_{ti} + u_{0i} + \varepsilon_{ti} \quad (3)$$

In these two models Υ_{ti} represents the observed condition at time *t* for individual *i*, β_{00} is the intercept depicting the average initial status mean between individuals, $\beta_{10}a_{ti}$ represents the linear time-related component, u_{0i} is the level 2 random component related to describing any differences in average reported self-regulated learning activity between students, and ε_{ti} represents the errors in predicting the average reported self-regulated learning activity for students. For the performance dimension, $\beta_{20}a^2_{ti}$ represents the quadratic time-related component. For reported forethought, performance and self-reflection activities, we used a scaled identity covariance structure for the repeated measures diary task effect, which is a simplified covariance structure with only one estimated parameter, and a variance components covariance structure for the intercept random effect (Heck et al., 2013).

In a third step, because we wanted to examine whether the treatment (training) was related to different growth patterns, we studied possible differences in development between the three groups of students. In particular, we wanted to understand if the change was the same or different for the experimental group, control group 1 and control group 2 in their reported self-regulated learning activity over time. So as to understand if students in the experimental group reported self-regulated learning activity over time differently from students in the control groups 1 and 2, we merged the level 1 model with time specified as linear for the performance and self-reflection dimensions and as quadratic for the performance dimension to describe students' growth over time. We assumed that the intercept would vary between subjects and that the time slope would randomly vary as well. This combined model for the forethought and self-reflection dimensions may be represented as:

$$\Upsilon_{ti} = \beta_{00} + \beta_{01}\, training_i + \beta_{10} time_{ti} + \beta_{11} time_{ti} * training_i + u_{1i} time_{ti} + u_{0i} + \varepsilon_{ti} \qquad (4)$$

For the performance dimension, this combined model included the quadratic time-related component and may be represented as:

$$\Upsilon_{ti} = \beta_{00} + \beta_{01}\, training_i + \beta_{10} time_{ti} + \beta_{20} quadtime_{ti} + \beta_{11} time_{ti} * training_i + u_{1i} time_{ti} + u_{0i} + \varepsilon_{ti} \quad (5)$$

In both the linear and quadratic representation of the model, Υ_{ti} represents the observed condition at time *t* for individual *i*, β_{00} is the intercept showing the average initial status mean between individuals, $\beta_{01} training_i$ represents the training variable (coded 0 for no training and 1 for training), $\beta_{10} time_{ti}$ is the linear time-related component, $\beta_{11} time_{ti} * training_i$ is the interaction parameter included to examine if there are different growth trajectories for the individuals in the three groups. Moreover, $u_{1i} time_{ti}$ and u_{0i} are the level 2 random components related to describing any differences in average reported self-regulated learning activity between students. Lastly, ε_{ti} represents to the errors in predicting the average reported self-regulated learning activity for students. For the performance dimension, the model includes $\beta_{20} quadtime_{ti}$, which corresponds to the quadratic time-related component. We used a scaled identity covariance structure for level 1 and an unstructured covariance structure for level 2 of the forethought, performance and self-reflection dimensions, which are simplified covariance structures and since our main goal was not to explain variance (Heck et al., 2013). We wanted our model to be as parsimonious as possible.

Lastly, we examined the improvement of each model over the previous one with the corresponding likelihood ratios. Specifically, this difference in likelihood approximates is in accordance with the chi-square distribution (change in degrees of freedom between models: subtraction of the number of new parameters added to the model from the parameters of the previous model). Hence, we report the differences in the deviances (by subtraction) as a verification that the model with the covariates fits the data better than the model with the intercept and time, and that this latter model fits the data better than the intercept only model.

Pre-post group comparisons. We performed pre-post group comparisons in order to test the effects of the training on students' reflective ability. We used students' responses from the first lesson to measure the pretest and from the last learning lesson to measure the posttest. Students' responses were coded so as to proceed with a quantitative analysis of the data from the three groups (H1). We computed inter-rater reliability between two raters using intraclass correlations (ICC). Results revealed good values ICC (2,2) = .98 (and above) for all coded variables according to the literature (McGraw & Wong, 1996). Hence, 98% of the variance in the mean of both raters was true score variance. Then, we tested the differences between the three groups with analysis of variance (ANOVA) using time as a repeated measurement factor. Furthermore, so as to provide a more detailed analysis as a warrant of this coded qualitative data (students' responses), we calculated the frequencies of the types of responses students wrote and present examples that may be seen in Appendix F. Overall academic performance (i.e. online oral task about sports and vocabulary task about sports) differences between the three groups were also calculated with an ANOVA using time as a repeated measurement factor with the scores from the oral task and the vocabulary task. Because of pretest differences between the three groups, we also computed analyses of covariance (ANCOVA) with the pretest value as covariate.

Results

For hypothesis 1, we conjectured that there were different growth rates of reported self-regulated learning activity over time between students who experienced training in CSCL environments and students who did not. By self-regulated learning activity we mean forethought, performance and self-reflection activity (the three phases of Zimmerman's Self-regulated Learning model). In order to test this hypothesis, we first calculated the correlations between the responses of the three different groups and the training. Table 9 presents

correlations which were computed across days and individuals (Schmitz & Skinner, 1993), the means for the three groups regarding their reported self-regulated learning activity, as well as the Cronbach's alpha coefficients for each dimension of self-regulated learning. Students' responses were significantly correlated with the training.

Then, we performed multilevel linear analysis for repeated measures designs with control group 2 as the reference group. Table 10 shows the model fit information (likelihood ratios) and estimates for the fixed and random effects. At level 1, the variance represents the variability in the average students' reported self-regulated learning activity estimates around their own growth trajectory (Singer & Willet, 2003). The estimates of variance for levels 1 and 2 of reported forethought activity (Z_w = 3.32, p <.001), reported performance activity (Z_w = 4.26, p <.001) and reported self-reflection activity (Z_w = 3.54, p <.001) imply that there was sufficient variation in intercepts across students. We computed the proportion of variance (ICC) using a one-tailed test for variances, giving us 19% of variance between individuals and 81% of variance within individuals for forethought. As for performance, we estimated 23% between individuals and 77% within individuals, whereas for self-reflection we estimated 20% between individuals and 80% within individuals. Therefore, we assumed that there was variance within and between students' reported self-regulated learning activity over time.

Table 9

Descriptive statistics. Reliability coefficients. and correlations of variables for multilevel analysis

Variables	Correlations				Group	Level 1 (*N* = 440)										Level 2 (*N* = 44)
	1	2	3	4		0	1	2	3	4	5	6	7	8	9	
1.Training		.26 †	.16	-.36**		*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
					EG	2.76(.70)	4.07(.50)	4.30(.29)	4.19(.32)	4.14(.40)	4.17(.31)	4.14(.37)	3.96(.43)	4.23(.28)	4.07(.31)	4.00(.58)
2. Forethought	.14**	(.79)	.71**	.50**	CG1	3.17(1.11)	3.42(.71)	3.71(.61)	3.68(.70)	3.90(.43)	3.54(.71)	3.76(.54)	3.84(.43)	3.76(.43)	3.70(.54)	3.65(.66)
					CG2	4.30(.42)	4.08(.94)	4.25(.98)	4.26(.97)	4.55(.28)	4.01(1.12)	4.62(.21)	4.55(.29)	4.58(.28)	3.37(1.36)	4.26(.85)
					EG	3.14(.98)	4.12(.38)	4.07(.37)	4.14(.37)	4.05(.49)	4.08(.47)	4.14(.36)	3.98(.68)	3.96(.35)	4.01(.65)	3.97(.60)
3. Performance	.12*	.43**	(.72)	.53**	CG1	2.75(1.10)	2.79(1.00)	2.96(.99)	3.01(.87)	2.85(.90)	3.00(.80)	3.07(.83)	3.17(.85)	2.98(.88)	2.81(.82)	2.94(.89)
					CG2	4.23(52)	4.03(1.13)	4.66(.15)	4.64(.18)	4.26(.97)	4.41(.75)	4.53(.40)	4.41(.99)	4.57(.40)	2.89(1.26)	4.26(.87)
					EG	2.26(.55)	4.07(.37)	4.10(.40)	3.78(.87)	4.21(.33)	3.92(.74)	4.16(.28)	3.96(.64)	4.14(.41)	4.12(.47)	3.87(.76)
4. Self-reflection	-.20**	.37**	.36**	(.92)	CG1	2.56(1.03)	2.89(.93)	2.87(.85)	3.03(.92)	3.01(.88)	2.84(.82)	2.64(.81)	3.17(.68)	2.95(.77)	3.12(.77)	2.91(.85)
					CG2	3.01(1.28)	3.10(1.33)	3.58(1.31)	3.82(1.28)	3.32(1.37)	2.39(.90)	4.44(.74)	4.25(.99)	2.55(1.04)	2.80(1.24)	3.33(1.30)

Note. †$p < 0.10$;*$p < 0.05$; **$p < 0.01$. EG= Experimental group; CG1 = Control group 1; CG2 = Control group 2. Correlations below the diagonal are day level correlations (*N* = 1000). Correlations above the diagonal are person-level correlations (*N* = 100). Cronbach's alpha coefficients are reported in brackets on the diagonal. The Level 1 means and standard deviations are reported according to the time variable (from 0 to 9.)

We compared the intercept-only model to the intercept + time model. The intercept + time model displayed a significant improvement over the intercept-only model (forethought: Δ *deviance* = 8.74, *df* = 1, $p < .01$; performance: Δ *deviance* = 31.52, *df* = 2, $p < .01$; self-reflection: Δ *deviance* = 7.74, *df* = 1, $p < .01$). In this second model, the intercept represents the students' reported self-regulated learning activity at the beginning of the study. Whereas the linear time variable was significant in explaining student growth in reported forethought and self-reflection, the quadratic time variable was significant in explaining student growth in reported performance activity.

The model containing the predictor variables and the interaction between them revealed a significant enhancement over the intercept + time model (forethought: Δ *deviance* = 37.41, *df* = 6, $p < .01$; performance: Δ *deviance* = 56.39, *df* = 6, $p < .05$; self-reflection: Δ *deviance* = 34.89, *df* = 6, $p < .01$). The results from this third model indicate that the students in control group 2 began with a mean of 4.33 for reported forethought activity, 4.22 for reported performance activity, and 3.37 for reported self-reflection activity. Results also show that there was an initial significant difference between groups for reported forethought activity and reported performance activity, as both the experimental group (forethought: 3.70; performance: 3.49) and control group 1 started off with lower values (forethought: 3.44; performance: 2.55). Moreover, while there was no initial significant difference between control group 2 and the experimental group for reported self-reflection activity, control group 1 started off significantly lower (2.76). Over each interval the scores of the control group 2 decreased on average by .01 points for reported forethought activity, increased by .17 points for reported performance activity, and decreased by .01 points for reported self-reflection.

Table 10

Fixed and random effects parameter estimates for models predicting reported self-regulated learning activity.

Parameter	Reported Self-regulated Learning Activity								
	Forethought			Performance			Self-reflection		
	Intercept-only	Intercept +Time	With Predictors	Intercept-only	Intercept +Time	With Predictors	Intercept-only	Intercept +Time	With Predictors
Fixed Effects									
Intercept	3.95**(.05)	3.81**(.07)	4.33**(.14)	3.69**(.05)	3.38**(.13)	4.22**(.16)	3.35**(.09)	3.15**(.11)	3.37**(.17)
Time		0.03**(.00)	-0.01 (.02)		0.23**(.04)	0.17**(.04)		0.04**(.01)	-0.01 (.02)
Time quadratic					-0.02**(.00)	-0.02**(.00)			
Training EG			-0.63**(.20)			-0.73**(.21)			0.03 (.25)
Training CG1			-0.89**(.19)			-1.67**(.20)			-.61**(.24)
Time X Training EG			0.08**(.03)			0.09**(.02)			0.11**(.03)
Time X Training CG1			0.06**(.03)			0.07**(.02)			0.04 (.03)
Random Effects									
Repeated measures	0.45**(.03)	0.44**(.03)	0.41**(.03)	0.49**(.03)	0.45**(.03)	0.43**(.03)	0.87**(.06)	0.85**(.06)	0.82**(.06)
Intercept/ Intercept+Time (1,1)	0.11**(.03)	0.11**(.03)	0.14**(.06)	0.49**(.11)	0.49**(.11)	0.16**(.06)	0.27**(.07)	0.27**(.07)	0.15 (.09)
(2,1)			-0.01 (00)			-0.00 (.00)			-0.01 (.01)
(2,2)			0.00 (.00)			0.00 (.00)			0.00 (.00)
Deviance	954.57	945.83	908.42	1042.80	1011.28	954.89	1250.28	1242.54	1207.65
AIC	960.57	953.83	928.42	1048.80	1021.28	976.89	1256.28	1250.54	1227.65
BIC	972.83	970.18	969.29	1061.06	1041.72	1021.85	1268.54	1266.89	1268.52

Note: Standard errors are in brackets. $^{\dagger}p < 0.10$;$^{*}p < 0.05$; $^{**}p < 0.01$. The extended values of the random effects of the Intercept+Time (2,2) variable in the models with predictors are .002** for forethought, .00004 for performance and .001 for self-reflection. The extended value of the random effect of the Intercept+Time (2,1) in the models with predictors for Performance is -0.0009**.

Additionally, our results show that the experimental group increased by .07 and control group 1 by .05 in reported forethought activity in comparison to control group 2. On average, the experimental group increased by .26 and control group 1 by .24 in reported performance activity when compared to control group 2. For reported self-reflection activity, the experimental group increased by .10, while control group 1 increased by .03. As we can see in figures 14, 15 and 16, the effect of the training (experimental group) was in rising the change over time seen in control group 2.

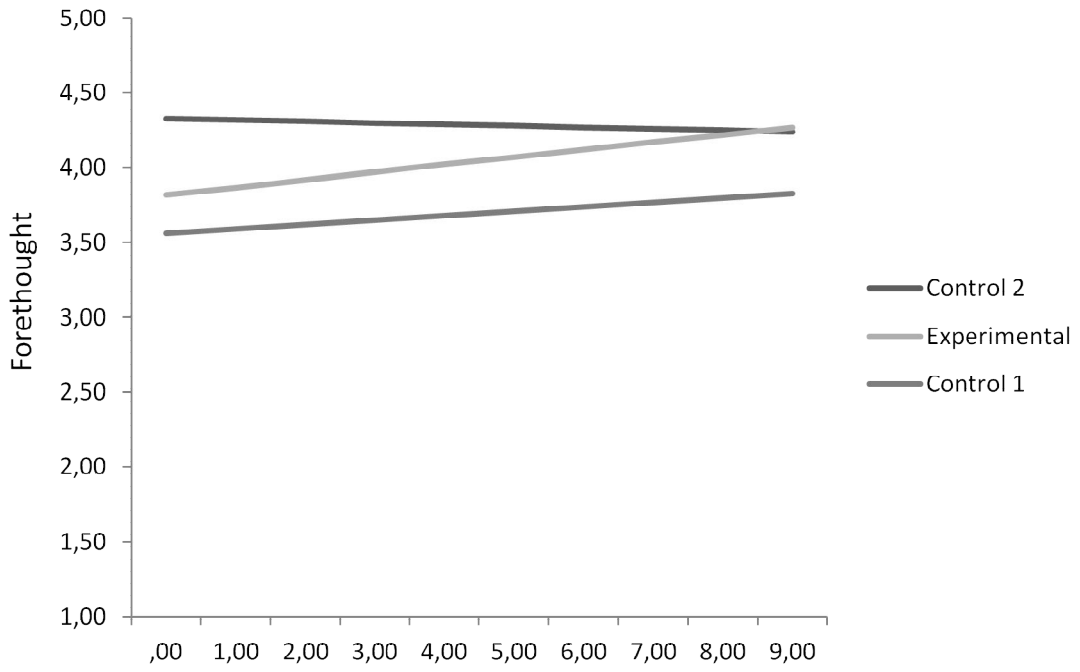


Figure 14. Fitted trajectories of the experimental, control group 1 and control group 2 for reported forethought activity.

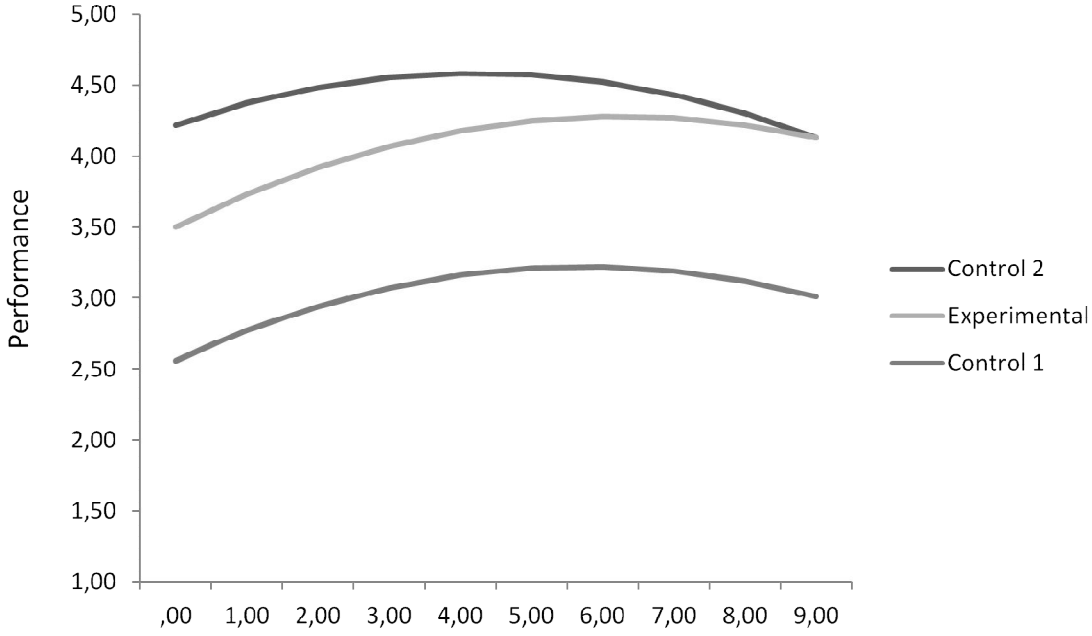


Figure 15. Fitted trajectories of the experimental, control group 1 and control group 2 for reported performance activity.

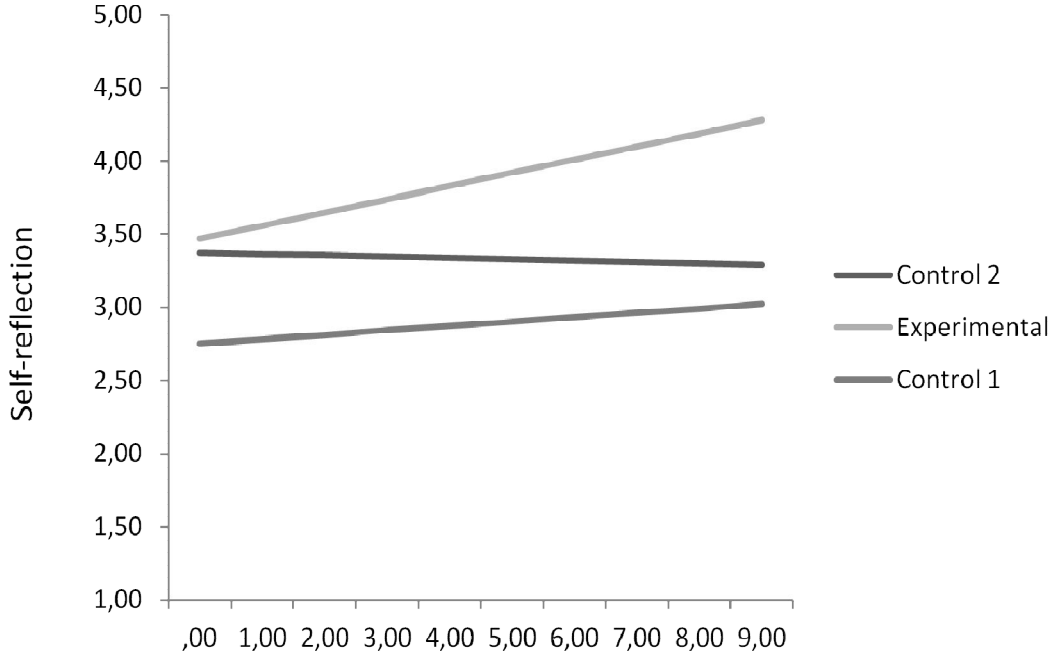


Figure 16. Fitted trajectories of the experimental, control group 1 and control group 2 for reported self-reflection activity.

Furthermore, our results suggest that there were significant differences in the growth rates of reported forethought, performance and self-reflection activities over time between the three groups. That is, over each interval, there was a difference of .08 points between the experimental group and control group 2, and of .06 between control group 1 and control group 2 for reported forethought. Also there was a difference of reported performance activity over each interval of .09 between the experimental group and control group 2 and of .07 between control group 1 and control group 2. Lastly, for reported self-reflection activity, there was a difference over each interval of .11 between the experimental group and control group 2, and of .04 between control group 1 and control group 2. In sum, while the experimental group increased over each interval in all of the reported self-regulated learning dimensions, control group 1 increased over each interval in reported forethought and performance and had a non-significant increase in reported self-reflection. Control group 2 stabilized in reported forethought and self-reflection and increased (although less than the other two groups) in reported performance. In order to understand the differences between the experimental group and control group 1, we reran the analysis with control group 1 as the reference group. The initial differences between the experimental group and control group 1 were significant for reported performance by .94 and self-reflection, by .64, but not for reported forethought. The growth rates of both groups (experimental and control 1) were not statistically significant. Thus, we can conclude that there were different growth rates of reported self-regulated learning activity over time between students who experienced training in how to regulate one's learning and students who did not, independently of computer use (H1).

As mentioned in the data analysis section, we used an ANOVA with time as a repeated measurement factor to test for differences between the pre and posttest of the groups' reflective ability in the open-ended questions (question 1: intentions to learn; question 2:

anticipations of learning outcomes; and question 3: self-examination). There were no significant differences between the three groups in the pretests for intentions to learn and anticipations of learning outcomes [e.g. $t(41) = -1.54$, $p > .05$; $t(41) = -1.10$, $p > .05$, respectively]. There were no significant differences between the experimental group and control group 1 for self-examination [$t(41) = 0.65$, $p > .05$], but there was an initial significant difference between the experimental group and control group 2 [$t(41) = 2.37$, $p < .05$]. Because there were pretest differences, we ran an ANCOVA with the pretest as covariate. Table 11 shows these results, along with the means and standard deviations. Considering Cohen's (1988) distinction between small ($h_p^2 = .01$), medium ($h_p^2 = .06$) and large effects ($h_p^2 = .14$), we found large effects for intentions to learn and anticipations of learning outcomes.

Table 11

Means (standard deviations) and results for the interaction Time x Group regarding intentions to learn, anticipations of learning outcomes and self-examination

DV	Group	Time		*Df*	*F*	h_p^2
		Pretest *M (SD)*	Posttest *M (SD)*			
Intentions to Learn	EG	4.07 (1.81)	7.07 (1.81)	2/41	10.95**	.35
	CG1	4.00 (0.81)	4.93 (2.04)			
	CG2	4.85 (1.29)	4.42 (0.64)			
Anticipations of Learning Outcomes	EG	4.14 (0.53)	6.21 (0.89)	2/41	3.77*	.15
	CG1	4.62 (1.14)	5.68 (0.60)			
	CG2	4.57 (1.22)	5.35 (1.15)			
Self-examination *a*	EG	4.78 (1.96)	6.50 (0.51)	2/41	2.09	.09
	CG1	3.68 (1.40)	6.25 (0.57)			
	CG2	3.28 (1.63)	4.21 (1.62)			

Note: *$p < 0.05$., **$p < 0.01$; EG: Experimental Group; CG: Control Group. Normality assumption were tested prior to analysis and fulfilled. *a* An analysis of covariance with the pretest as covariate was run due to pretest differences for the students in the different groups. The *M* and *SD* presented are not adjusted.

These results confirm in part our second hypothesis stating that students who experience training in CSCL environments report their reflections more autonomously and specifically in their diary task than students who do not. Specifically, the results of students'

ability to reflect about their intentions to learn and anticipations of learning outcomes revealed significant differences in favor of the experimental group when compared to control groups 1 and 2 (see figures 17 and 18). Students in the experimental group were more autonomous and specific in reporting their reflections about their intentions to learn and anticipations of learning outcomes. There was no significant interaction between time and group for self-examination (see figure 19). Nonetheless, we found a significant large effect of time (h_p^2 = .40) in all groups (F (1,41) = 27.64, p < .001), having the experimental group scored significantly higher than control group 1 (on average 2.03, p < .01, h_p^2 = .41) and control group 2 (on average 2.28, p < .01, h_p^2 = .46) in the posttest.

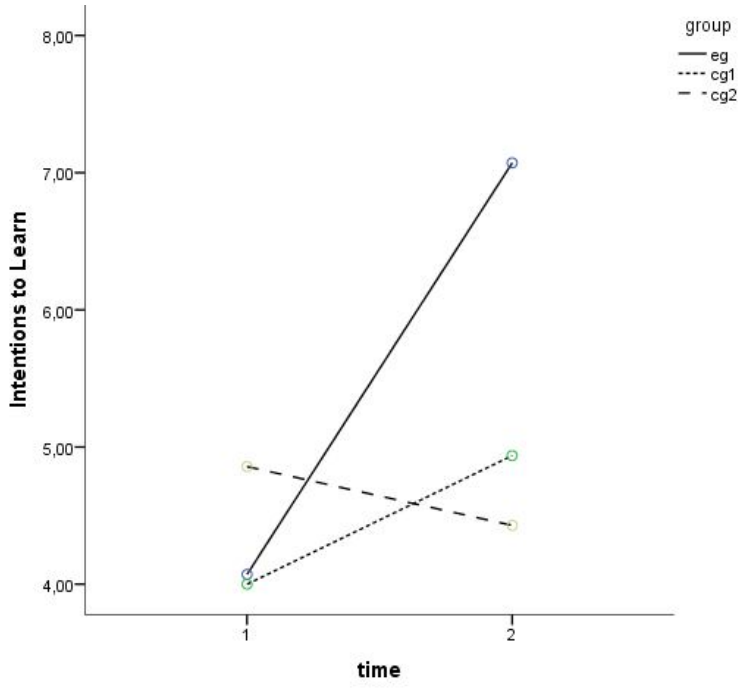


Figure 17. Significant interaction time x group for reported use of learning strategies in students' intentions to learn.

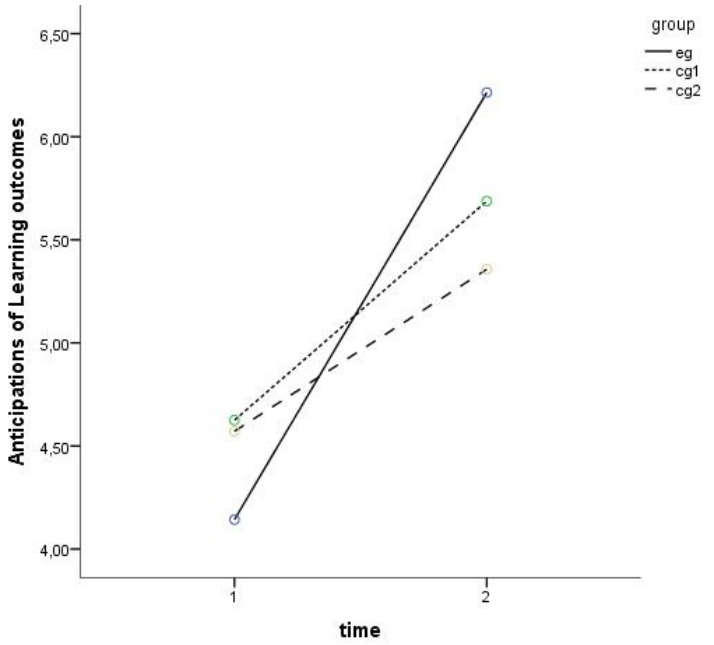


Figure 18. Significant interaction time x group for reported use of learning strategies in students' anticipations of learning outcomes.

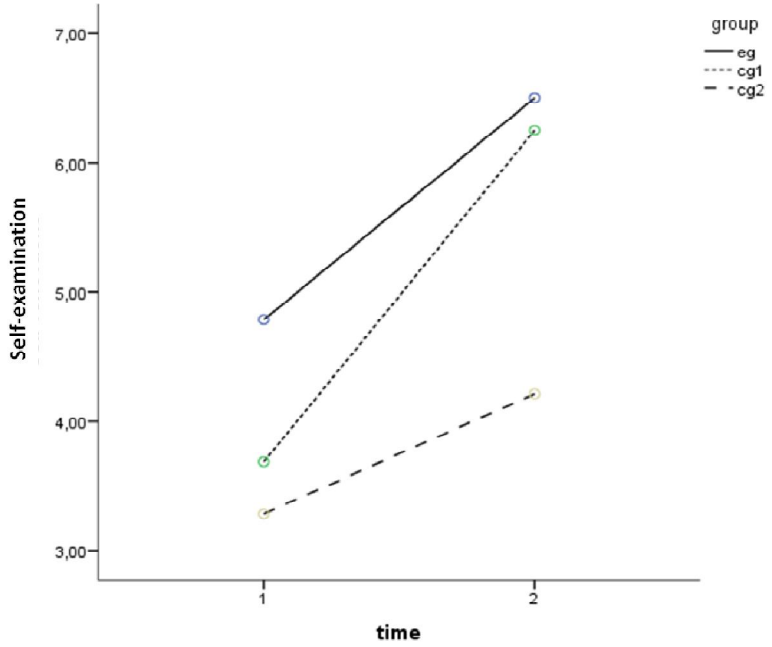


Figure 19. Significant interaction time x group for reported use of learning strategies in students' self-examination.

The frequencies we present in appendix F show in more detail and with examples of how the students who had training in a CSCL environment reported their reflections more

autonomously and specifically in regards to their intentions to learn, anticipations of learning outcomes and self-reflections than the students who did not.

Concerning hypothesis 3, we posited that students who experienced the training in a CSCL environment would have better overall academic performance than students who did not. As mentioned in the data analysis section, we measured overall academic performance with an oral and vocabulary task about sports before and after the intervention. We performed an ANOVA with time as a repeated measurement factor. We found large effects regarding students' overall academic performance (see table 12).

Table 12

Means (standard deviations) and results for the interaction Time x Group regarding academic performance

DV	Group	Time		*df*	*F*	h_p^2
		Pretest *M (SD)*	Posttest *M (SD)*			
Oral Task about Sports a	EG	1.80 (0.36)	3.99 (0.94)	2/40	49.01**	.71
	CG1	2.05 (0.31)	2.76 (0.40)			
	CG2	2.10 (0.34)	2.15 (0.42)			
Vocabulary Task about Sports a	EG	0.46 (0.11)	0.60 (0.11)	2/40	10.89**	.35
	CG1	0.59 (0.10)	0.66 (0.14)			
	CG2	0.49 (0.10)	0.40 (0.17)			

Note: *p < 0.05., **p < 0.01; EG: Experimental Group; CG: Control Group. Normality assumption were tested prior to analysis and fulfilled. a An analysis of covariance with the pretest as covariate was run due to pretest differences for the students in the different groups. The *M* and *SD* presented are not adjusted.

Because there were pretest differences, we ran an ANCOVA with the pretest as covariate. Results indicate significant differences between groups. While figure 20 shows a significant interaction between time and group in favor of the experimental group in the oral task about sports, figure 21 illustrates how CG1 performed better in the vocabulary task about sports.

These results support in part our third hypothesis that students who experience training in how to regulate one's learning in a CSCL have better overall academic performance than students who do not. Specifically, the students that had the training in the CSCL environment performed better in the oral task. Nonetheless, independently of the computer support, students who had the training (i.e. experimental group and control group 1), performed better in both tasks than the students who had no training (control group 2).

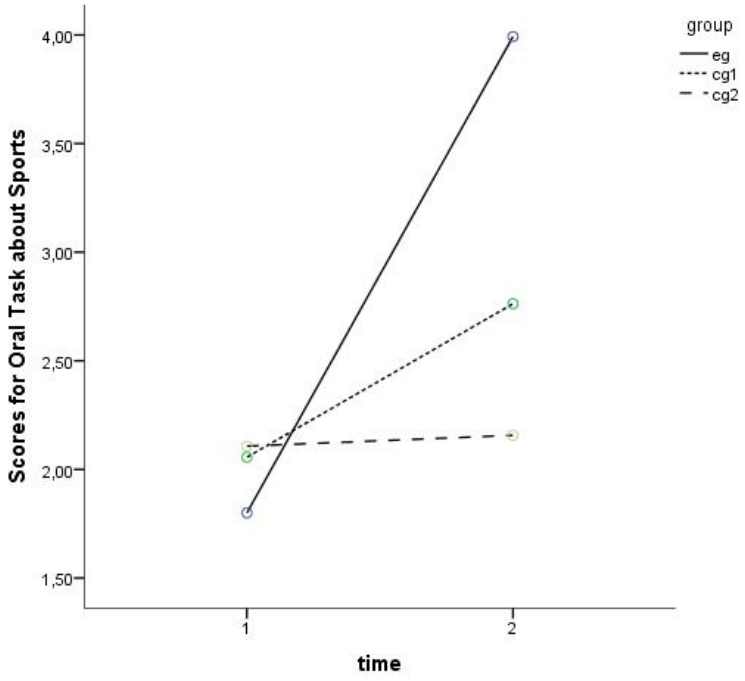


Figure 20.

Significant interaction time x group for oral task about sports.

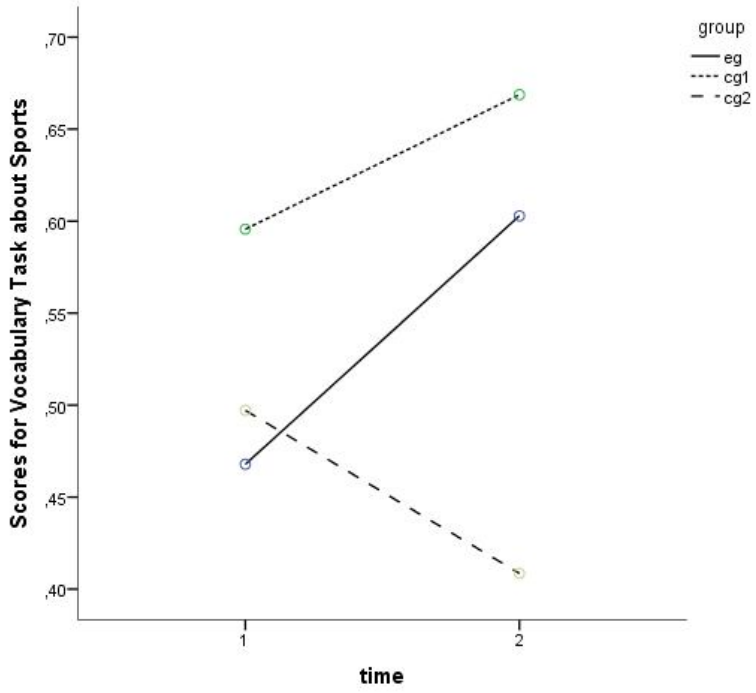


Figure 21.

Significant interaction time x group for vocabulary task about sports.

Discussion

This study aimed to provide a better understanding of whether the impact of training the regulation of learning in CSCL environments on learners' reported use of learning strategies in their intentions to learn, anticipations of learning outcomes, and self-reflections, as well as on their reported self-regulated learning activity and performance was different from other learning environments. In order to do so, we used a quasi-experimental study design, as suggested by Perry and colleagues (2010), with pre and posttests in three different groups: an experimental group that experienced training in how to regulate one's learning in a CSCL environment and that filled in learning diary tasks, a first control group that also experienced training in a collaborative learning environment and that filled in learning diary tasks, but without the support of a computer to learn, and a second control

group that had their regular EFL classes and only filled in the learning diary tasks. We feel that this study contributed to the literature in methodological terms because it reports quantitative and qualitative findings from three groups in a classroom context (i.e. experimental 1, control group 1, control group 2), providing us with a high level of ecological validity, as suggested in the literature (Schmitz & Wiese, 2006). One of the main contributions of this study was also the emphasis that was given to students learning within a multimedia environment, as has been suggested in the literature (Azevedo & Cromley, 2004; Zimmerman, 2013). Furthermore, Järvelä and her colleagues (2011) clearly indicated how research should focus on both theoretical and empirical analyses of meaningful learning in authentic environments in which the regulation of learning and collaboration are fostered. By doing so, researchers' understanding of learners' engagement in learning and their motivations to learn could be enhanced. Hence, we tried to explore how students reported their self-regulated learning activity and how they performed in this type of environment. We studied learners' perceptions of their own regulation of learning (Joo et al., 2000), and performance indicators, which made it possible for us to examine students' covert processes, as well as overt behavior (Järvelä et al., 2012). This study also focused on a domain-area (EFL) that is not usually studied in terms of processes involving the regulation of learning, as recommended in the literature (Greene et al., 2010).

Hypotheses-related Considerations

Similarly to other studies regarding aspects about the regulation of learning, including motivation, efforts to learn and self-evaluations (i.e. Dangwal & Thounaojam, 2011; Järvelä et al., 2012; Pacheco, 2013; Perry et al., 2010), we found differences in growth rates of reported self-regulated learning activity over time between students who experienced training in how to regulate one's learning and students who did not, independently of computer use (H1). Nonetheless, unlike most studies, our study allowed us to measure this over time with

multilevel linear analysis and with three different groups. The fact that we found an initial significant difference between groups, could be because, as the teacher stated, students in primary education in Portugal, namely in EFL classes, do not usually plan, monitor and evaluate their work intentionally and explicitly. Students only self-evaluate their work at the end of each academic period. Furthermore, the fact that we verified an increase of reported self-regulated learning in the experimental group and in control group 1 over time in comparison with control group 2, who started generally with higher scores, could have to do with motivational factors. That is, the teacher who participated in the study informed the researchers that the students who had the training, especially the students working with the computer, were extremely motivated to learn and to go to class because they did different things from what they were used to. The teacher referred that the students in the experimental group, really enjoyed using a computer to study EFL and that this way of learning made classes meaningful to them, as previous authors have suggested learning should be (Boekaerts, 2002b). This result is consistent with Järvelä and her colleague's study (2012), where they found that the students who were more motivated, were also more active in expressing how they self-regulated their learning.

The design we used allowed us to confirm our second hypothesis with regards to the differences between the groups. Similarly to previous studies regarding students and multimedia learning (Dressel & Haugwitz, 2008; Ladel, 2006; Meltzoff et al., 2009; Roschelle, 2013), we found that the students who experienced training in how to regulate learning in a CSCL environment were more autonomous and specific in reporting their reflections about their intentions to learn, anticipations of learning outcomes and self-examination than students who did not. However, because we used two control groups unlike most studies (control group 1 with training but no computer support and control group 2 with no training), we were also able to see that regardless of the computer support, students who had training

(experimental group and control group 1), were more autonomous and specific in reporting their intentions to learn, their anticipations of learning outcomes and self-examination than control group 2. These findings are highly relevant for the field of the regulation of learning and technology because they indicate that students who had training in regulated learning with the support of a computer, in fact, reported more autonomous and specific in reporting their reflections than students who did not have training. The fact that the experimental group worked in a computer-supported environment revealed significant differences in relation to control group 1 and control group 2. Again, as seen in hypothesis 1, there could be a motivational aspect involved in this result because according to the teacher (in the daily meetings), students in the experimental group seemed to be more motivated in relation to what they wanted to study because they were using a computer tool which they normally did not use.

Lastly, we proposed to study whether there were any differences in overall academic performance between students in the different learning environments (H3). Our results from the pre and posttest comparisons are in accordance with the literature (Pacheco, 2013; Proctor et al., 2011) and supported in part our third hypothesis. The students that had the training in the CSCL environment performed better in the oral task, which is what we had predicted. Nonetheless, and again, the fact that we used three different groups in our study, unlike most studies, allowed us to understand the differences or lack of differences between the two groups that the training regardless of computer use. That is, independently of the type of learning environment, (i.e. computer-supported or not), the students who had training performed better in both tasks than the students who had no training. We found that control group 1 scored higher than the experimental group in the vocabulary task. Moreover, if we consider that both groups (experimental group and control group 1) had a significantly higher performance in the vocabulary task than control group 2, we can conclude that training the

regulation of learning provided opportunities for improvements in learning (Sanchez-Villalon et al., 2010), especially considering the EFL context contemplated in this study.

Limitations and Suggestions for Future Research

Some limitations of the current paper should be considered, as well as suggestions for future research. Firstly, although the amount of data we analyzed was substantial, we worked with a small sample size and future work should include a larger sample size to study findings as the ones presented here. Secondly, no specific collaborative learning variables nor any specific strategy use variables were considered in this paper due to the aims of the study presented here, as well as due to space limitations. Nonetheless, we intend to do so in the future from the data collected in this study with detailed log files. Thirdly, we only studied the diary task and the training in how to regulate one's learning in EFL classes in a Portuguese context. It would be interesting to study both the diary task and the regulated learning training in other domain areas and for longer periods of time. Future studies could also focus on other countries, or even cross-cultural studies. Furthermore, the fact that we had some initial significant differences between groups, which may occur in quasi-experimental studies, could also constitute a limitation of this study. Also, in this study, we only applied the diary task and the training for a trimester of the school year. It would be interesting to study the effects of the diary task and the training throughout an entire school year. What's more, the log file data was not examined in this study, even though we used the results from the online oral and vocabulary tasks as support for our third hypothesis as recommended in the literature (Azevedo & Cromley, 2004; Geer & Sweeney, 2012; Järvelä et al., 2012; Joo et al, 2000). Lastly, because of the contextually situated data gathered in this study, detailed individual differences of the students were not considered specifically. Hence, in future studies, students' individual differences should be considered.

Conclusions and Implications of the study

The aims of this study centered on investigating the effects of training the regulation of learning on how students reported self-regulated learning activity and their reflections, as well as on how they performed in different learning environments with and without technology (EFL classes promoting collaboration and regular EFL classes). We believe the methodological approach (i.e. quasi-experimental design with pre and posttests) used, fit the fine-grained contextual process needed to gather data throughout the learning lessons. The results we presented from this data regarding the regulation of learning reinforces the need for research and practice to continue to focus on how students can regulate their learning and how this can be developed in training lessons.

As other authors (e.g. Järvelä et al., 2012), we believe that technology tools have the potential to help students become aware of metacognitive and motivational aspects, while actively regulating their learning. The results presented in this paper showing how the students in the experimental group reported their reflections more specifically and autonomously, have important implications for theory and practice because they suggest that the role of technology in providing feedback to students must be investigated closely. These tools can decrease the time lapse between task execution and knowledge of own performance results. This opens new opportunities for learners to make intentional, responsible and appropriate choices as they monitor their work, and supplies them with instant knowledge that guides them towards strategic action. The choices made with the information provided by these tools could be different if given at a later time in traditional educational settings. This would also have implications in terms of student gratification because they could be empowered to improve performance at their own pace. Thus, it is

important that theorists consider these tools when conjecturing about learners and how they think about and manage their learning process. Furthermore, teachers could use these powerful tools that can help them guide their learners in regulating their learning more efficiently.

As we presented in this study, tools such as diary tasks are useful tools in documenting students' awareness of their self-regulated learning activity (Schmitz & Wiese, 2006). Our results demonstrated how diary tasks can capture change in learners' reported perceptions of how they wanted to regulate and in fact, regulated their learning. With the type of information provided by these tools, researchers and teachers have support in co-constructing meaningful learning environments so that the learners may become active agents in regulating their own learning process. Specifically, research could investigate and help how teachers design their teaching environments in order to fit the needs of each learners' personalized learning environment in order to regulate their learning. It is at this point where research on educational psychology stands and should be heading towards.

General Discussion

"In an economy driven by knowledge rather than manufacturing, employers are already valuing very different skills, such as creativity, communication, presentation skills and team-building. Schools are at the front line of this change and need to think about how they can prepare young people for the future workplace."

(Greene & Hannon, 2007, p.15)

General Discussion

This investigation aimed to provide insights on how the processes involved in the regulation of learning can be observed and encouraged in contemporary academic contexts in order to provide young students with tools for life-long learning. Generally, we aimed to demonstrate that children can learn and regulate their learning individually or collaboratively in their surrounding physical and social environment according to their learning goals by providing them with opportunities to make choices. Moreover, we aimed to show how using diary tasks could be beneficial for capturing motivational processes and perceptions involved in the regulation of learning.

In a first step, we proposed to examine students' general understanding of how they think and function as students in EFL classes. Then, by providing students with instruments that promoted on-going reflection about themselves and their work before, during and after learning tasks, we intended to understand how changes could occur towards deep reflection. To understand these changes from a self-regulation perspective, we asked students to go through training that would teach them the processes and strategies of regulating learning explicitly. Furthermore, by examining these changes occurring within a classroom context, we aimed to understand how students could learn about how they learn and thus, improve how they learn individually and/or collaboratively. Accordingly, this investigation aimed to observe these changes within collaborative learning environments over time and study whether these environments supported these changes in a meaningful way for students. Ultimately, we aimed to investigate how learning could be meaningful for students by examining their performance, beliefs and perceptions about themselves and the learning tasks/environment available to them. The contributions of this investigation to the study of the regulation of learning arise from its proposed objectives and concomitantly, its findings. In particular, the examination of effective regulation of learning of motivated young EFL students in a CSCL

environment, by using quantitative and qualitative methodologies.

What Children Understand About How They Think And Function In The Classroom

This investigation proposed to examine what children aged 9 to 11 understand about how they think and function in the EFL classroom. Firstly, the results from the first study enabled us to conclude that children do not distinguish between metacognitive knowledge and metacognitive skills. Rather, children seem to interpret metacognitive knowledge and metacognitive skills as one only construct (metacognitive awareness), rather than two separate constructs because they still have difficulty in reporting their MA, as there is a tendency of overrating (Allwood et al., 2005; Allwood et al., 2008; Shin et al., 2007). In fact, this is one of the conclusions of this study, that there is a tendency for children to overrate their metacognitive awareness. To specify, the item difficulty distribution of the instrument we used (CATOM) was low in comparison with the students' responses, revealing that children in fact overrated their metacognitive awareness. Although some studies indicate that children in primary school have the capacity of being consciously aware of themselves and of their thinking processes (Bronson, 2000), our evidence showed that this capacity has much to be develop in children aged 9 to 11. These results resemble those of other authors (Lipko-Speed, 2013), who found that young children's reports of their metacognitive awareness are inaccurate, although overconfidence lowers a bit when reporting about past performance with repeated trials.

Nonetheless, other research has shown that some overconfidence in monitoring for example may be important for the successful regulation of learning when it emerges from metacognitive judgments (Dunlosky & Rawson, 2012). As Dunlosky and Rawson (2012) resumed, overconfidence could produce underachievement. Nonetheless, overconfidence in monitoring could be positive in terms of persistence and in promoting corrective changes during the regulation of learning, but specifically if students are provided with feedback and if

they possess prior knowledge of the subject matter. Hence, the effects of overconfidence are generally dependent on external and internal factors that may or may not be constructive towards learning. The authors also indicated that students could profit from interventions that aimed to improve their ability to judge their learning. Finn and Metcalfe (2014) found that third and fourth-grade children possess a persistent overconfidence as a result of positively biased memories of prior errors. As the authors indicate, students overconfidence in their knowledge could direct them towards using inappropriate strategies to learn and the amount of time allocated to studying and practicing.

The findings from this investigation contribute to understanding how children report their metacognitive awareness in EFL classes, as it is still unclear how children acquire metacognitive awareness in the first place and few studies have investigated metacognitive aspects of self-regulation within this age group (Efklides, 2011; Wigfield et al., 2011). As Boekaerts posited (2002b), teachers should allow their students to reflect on and practice the regulation of learning and at the same time, receive feedback from the students about these processes. By knowing what their students understand about how they think and function in class, teachers can provide more meaningful learning experiences that will enable students to develop their metacognitive awareness and consequently, how they regulate their learning.

Reflecting and Improving How To Learn In Meaningful Learning Environments

This investigation also aimed to understand whether changes could occur in the way students reflect about how they learn and improve how they learn by providing them with learning tools and experiences to develop. Through multilevel analyses of the diary data gathered in studies two and three with the DOGS-RL, we were able to conclude that the students who had training in how to regulate their learning, reported a different growth rate of self-regulated learning activity in their diary task over time than students who did not have

this training. Considering this reported self-regulated learning activity involved reflecting on task interest, level of difficulty, effort made and ability to accomplish the task, these results meet some of the challenges proposed for future research regarding the measurement of self-regulated learning (Cascallar et al., 2006; Moos & Azevedo, 2008). Specifically, students in the experimental groups revealed that they liked to, found it less difficult to, made an effort to and were able to plan, monitor and evaluate their work more as time progressed than students in the control groups. As a contribution to the literature, our results pertained to process data gathered from diary data in a classroom environment of primary-school students who regulated their learning of EFL. Not only was the instrument used beyond typical survey measures as the literature recommends (e.g. Azevedo & Cromley, 2004; Schmitz et al., 2011), but the target sample and domain-specific context were understudied areas of self-regulated learning (Greene et al., 2010). Furthermore, the fact that the instrument was applied in class, rather than being sent for homework like most studies (e.g. Glogger et al., 2012), was also a novelty, providing our investigation with a stronger ecological validity. In study three in particular, we also differentiated between two groups that had the training in regulating their learning (experimental group with computer support and control group 1 without computer support), but with different learning environments. In this case, the experimental group also reported a different growth rate of self-regulated learning activity in their diary task over time than control group 2. However, both groups experiencing the training, regardless of computer use, had similar growth rates of reported self-regulated learning activity, although the experimental group expressed their self-regulation of learning with higher values. This result is similar to other studies involving groups learning in CSCL environments (Dangwal & Thounaojam, 2011; Järvela et al., 2012; Pacheco, 2013; Perry et al., 2010). Because this reflective process using diary tasks was done in a classroom environment with teacher supervision in both studies two and three (unlike most studies: i.e.

Perels et al., 2007), we were able to better control any differences between classroom practices (training vs. no training) and provided this investigation with good ecological validity as well.

Another important finding of this investigation was that students, who experienced training in how to regulate learning in both studies two and three, were more autonomous and specific in reporting reflections regarding their intentions to learn, anticipations of learning outcomes and self-reflections in their diary task. These results indicate that students who experienced training in regulating their learning were strategic, autonomous and specific in reporting their reflections rather than descriptive about learning content (Perels et al., 2007; Otto, 2007; Schunk & Zimmerman, 1998; Stoeger & Ziegler, 2008; Stoeger & Ziegler, 2011; Wolters et al., 2003; Zimmerman, 2000). In study three specifically, because we used two control groups unlike most studies (Dressel & Haugwitz, 2008; Ladel, 2006; Meltzoff et al., 2009; Roschelle, 2013), we found that students in the experimental group reported were more autonomous and specific in reporting their intentions to learn, anticipations of learning outcomes and self-examination, than students who also had the training, but without computer support. These findings are of considerable relevance for the field of self-regulated learning and technology because they indicate that students who had training in how to regulate learning in the CSCL environment developed their reflective ability before, during and after they engaged in learning. There is a motivational aspect behind this result in study three because according to the teacher (in the post-intervention interview and in the daily meetings), students in the experimental group were more motivated in relation to what they wanted to learn because they were using a computer tool which they enjoyed using. Unlike most studies that only have an experimental group and a single control group, we used two control groups, allowing us to find some differences between the students who had and did not have the support of a computer in their learning environment (e.g. Barnard, Lan, To,

Paton, & Lai, 2009). Also, as in study two, we collected our data from an in class environment, as we did with the second because it would allow our students to interact directly with each other, hence having access to knowledge regarding their colleagues' functioning and affect.

Similar to what has been discussed in previous literature (Cleary, 2011), motivation was a key element in students' perceptions of their forethought, performance and self-examination activities because of the positive interest they revealed throughout the sessions regarding these experiences in their responses. This reinforces Boekaerts' (2002b) belief that researchers and teachers should focus on powerful learning environments that give students the opportunity to generate their own learning goals, allowing them to experience meaningfulness within their learning context. With this investigation, we tried to follow the suggestions of Järvela and her colleagues (2011), who stated that research should be centered on theoretical and empirical analyses of meaningful learning in authentic environments in which the regulation of learning and collaboration are fostered. We tried to understand students' motivations to learn and how they engaged in learning in different learning environments by exploring how they reported their self-regulated learning activity, reflective ability and how they performed. This directed our investigation to the next findings regarding students' performance.

The results from studies two and three revealed better performance results in EFL for the students in the experimental groups. If we consider academic performance in general, these results are similar to those from previous studies, where students who used diary tasks and experienced training in how to regulate learning, performed better academically (Glogger et al., 2012; Otto, 2007; Pacheco, 2013; Perels et al., 2009). Nonetheless, and considering that this is one of the contributions of this study, while most of these studies investigated training the regulation of learning and diary tasks in math, this investigation was centered on

EFL classes, where there is less research in this field (Greene et al., 2010). In study three specifically, we found that students in the CSCL environment (experimental group) had better performance in oral communication than the students in control group 1 (without computer support), but no significant differences were found between these two groups in terms of vocabulary performance. Despite this result, control group 1 started with a significantly higher performance in the vocabulary task than the experimental group, meaning that the experimental group had a greater improvement from the pre to the posttest, thereby confirming that computer-supported learning does, in fact, provide opportunities for improvements in learning (Sanchez-Villalon et al., 2010), specifically in regards to EFL.

This investigation focused on how contemporary learning environments could support changes in students' learning processes in a meaningful way and understand how students could learn within these environments. This enabled us to examine the students' reflections and performance indicators, as has been recommended in the literature (Azevedo & Cromley, 2004; Geer & Sweeney, 2012; Järvela et al., 2012; Joo et al., 2000). Our results revealed that the students in the experimental groups had an increased growth rate of reported self-regulated learning activity and were more specific and autonomous in reporting their reflections compared to the control groups. In study two, we were able to see that the experimental group had better academic performance than the control group. Moreoever, because in study three we had three difference groups, unlike most of the literature we presented, we were able to understand that the experimental group had better oral performance, but that control group 1 (with training and no computers) performed better in the vocabulary task. The experimental group in study three in particular, was in a CSCL environment which gave them immediate access to their performance results (i.e. both oral and written assignments). Thus, they focused more on their oral production because they could listen to their voices, which they were not used to doing. In this regard, these students

had more information available to them about how they functioned in class. In other words, the platform provided them with immediate feedback about tasks they had just completed (e.g. listening to their own recording). One of the main contributions of this investigation was thus the emphasis that was given to learning within computer-supported learning environments, as suggested in the literature (Azevedo & Cromley, 2004; Zimmerman, 2013).

Limitations and Suggestions for Future Research

This investigation is not without its limitations. To specify, the instruments used throughout the studies, namely, the CATOM and the DOGS-RL could be further tested and adapted in future studies in order to assess other aspects (i.e discriminative validity, concurrent validity, test-retest reliability, etc.), as indicated in the literature (Lavrakas, 2008; Stevens, 2009). Future studies could also present a different online format of the instruments and use larger samples during longer periods of time with students of other ages, in other disciplines and/or from different countries. It would also have been interesting to have applied the CATOM in study two in order to measure those students' metacognitive awareness before they participated in the study to test for group differences. Nonetheless, because statistical analyses were still being conducted, we only applied the CATOM in study 3 in order to test for initial group differences.

Also, as we mentioned in studies two and three and in terms of the design of the investigation where we used repeated measurements, there could be a regression threat regarding that fact the students responded various times to the diary task, which could cause their scores to regress towards the mean. In fact, there could have been progress effects on the students who could have experienced other changes during the interventions, although we tried to control this with the control groups. What's more, because students filled in many diaries, there could have been a memorization effect, where they filled in the diaries based on what they remembered they put in the previous one. We tried to understand whether this had

taken place by interviewing the students in study two about how they felt while filling in the diary. Since students responded they were quite motivated to respond to the diary, we feel that we could have potentially overcome this limitation. Also, the fact that we found some initial significant differences between groups could indicate an advantage of certain groups over the others. Nonetheless, with a quasi-experimental design, this limitation was difficult to control because classes were pre-organized by the schools. Students were not randomly assigned to classes. Lastly, we did not consider presenting individual cases. Future studies could analyze the individual paths of these students and test for any individual differences. It would also be interesting for future research to examine specific collaboration and regulation processes within contemporary learning environments supported by technology. In particular, from the log files provided by the computer, research could focus on which strategies students used, what they used them for and whether they used them individually or in collaboration with other students. Lastly, it would be interesting to study in the future why students made the choices they made in order to learn.

Implications for Research and Practice

With the studies of this investigation we were able to demonstrate that in fact, children can and did learn and regulate their learning individually and/or collaborative in their surrounding physical and social environment, and that the diary tasks captured motivational processes and perceptions involved in the students' regulation of learning. This investigation presents an important contribution to the field of self-regulated learning in terms of the methodological choices and procedures that were adopted. In particular, the investigation started from a large-scale sample to investigate students' metacognitive awareness and from a large-scale sample of diary entries to understand the effects of training in how to regulate learning on students' reflections and reported self-regulated learning activity. Since there is

still much to do in terms of studying self-regulated learning as a process (Zimmerman, 2013), this investigation presents the advantage of how using multilevel analysis can be useful for analyzing processes and perceptions. Furthermore, the fact that we used IRT, allowed us to consider both individuals' performance and the instruments' performance, unlike many studies, which enabled us to understand where students' responses stood in terms of accuracy. Moreover, this investigation also presented the advantage of studying a large amount of detailed information with both qualitative and quantitative approaches. In sum, by using the students' answers from the open-ended questions in the diary, by observing them and by interviewing them with regards to the intervention, we were able to understand how in fact they functioned inside the classroom. Thus, the fact that we used general and specific information to understand students' perceptions and actions, constitutes a strength of this investigation. Lastly, as a result of these methodological choices, this investigation introduced two new instruments that may be used and tested in futures research. This in itself, is also an important contribution.

This investigation presented results that have interesting implications for research and practice. As mentioned, the fact that this investigation presented tools that may be used by other researchers and practitioners in the field of educational psychology, can help identify how learners view and report their functioning as students in learning environments. The information provided by the CATOM at an initial phase, and the DOGS-RL and the adapted *Moodle* platform in a continuum, could guide teachers in designing meaningful learning environments and adapting pedagogical practices so as to attend to their students' needs. As Boekaerts (2002b) and Hofer (2005) advocate, teachers should have a realistic view of the beliefs their students bring into the classroom regarding learning. This type of knowledge could guide teachers in planning learning activities according to their beliefs. Tools such as diary tasks for example, can be useful to document students' awareness of their self-

regulated learning activity and can capture change in students' learning objectives, anticipations of learning outcomes/performance, reported perceptions of how they wanted to regulate and in fact, did regulate their learning, and lastly, their self-evaluations (Schmitz & Wiese, 2006). In regards to the Moodle platform in particular, and as Järvela and her (2012) posited, technology tools can help students become aware of metacognitive and motivational aspects, while actively regulating their learning. Moreover, technology tools can provide students with a new freedom to decide and engage in intentional, responsible and appropriate learning as they monitor their work. The fact that students are given instant knowledge that can guide them strategically can have great implications in terms of student satisfaction because they can learn in a way that is meaningful for them. Teachers could also use these tools that can help them guide their students in regulating their learning more efficiently. This could also have important implications for a personalization of students' evaluations in school (Cleary, 2011).

The findings from this investigation also have implications regarding the way in which training the regulation of learning in collaborative learning environments (with and without computer support) can be meaningful for students and have a positive impact on their intentions to learn, anticipations of learning outcomes, and self-reflections, as well as on their reported self-regulated learning activity and performance. By collecting data from the students' perspective and performance in different learning environments, we were able to capture the constant changes that occurred in the classroom. The fact that this investigation yielded positive results in favor of the students that trained the regulation of learning and the use of CSCL environments to support self-regulated learning, as other previous studies have suggested (Fridin, 2014; Psycharis et al., 2014), reinforces the need for researchers and education professionals to invest in working with flexible and dynamic learning environments to improve students' performance and self-regulated learning competencies and processes

(Azevedo & Cromley, 2004; Bandura, 2006; Cleary, 2011; Graesser & McNamara, 2010; Zimmerman, 2013). Hence, as stated by authors previously mentioned, training the regulation of learning helps students learn to learn, both at an individual and/or collaborative level (Bandura, 2006; Boekaerts, 2002b; Schmitz, 2006; Wolters et al., 2003; Zimmerman, 2013). Ultimately, by learning to learn in CSCL environments, students are simultaneously developing their regulation, collaborative and ICT literacy skills.

The implications of this study are also importance in terms of learning EFL in elementary school because of the performance results obtained and satisfaction demonstrated by the students in the experimental groups. Firstly, the students that had training improved their performance significantly. What's more, the students that used the computer, developed their oral skills substantially because they were able to listen to themselves and their colleagues as they spoke the foreign language. This brings great implications for practice because if students are given the opportunity to monitor their performance (individually or collaboratively), and improve their speaking skills (one of the national EFL curriculum's priorities for this grade level), then the use of technology (such as the *Moodle* platform) adapted according Zimmerman's models of self-regulated learning (2013) and Järvela and Hadwin's (2013) conceptualization of self-,co-, and shared regulated learning, are of an indispensable nature if students are to communicate in the English language (Chang, 2005; Larkin, 2010; Sadeghy & Mansouri, 2014; Tabatabaei & Hoseini, 2014). Lastly, we are confident that if research and practice continue to invest in EFL in these learning contexts, then students will be able to progress according to European standards (European Commission, 2011).

Final Considerations

In light of the rising learning demands of the 21st century, students must engage in their academic path in a proactive and strategic manner. There is a basis from which students can

start working from early on in their academic career so that they may contribute to their life-long learning process efficaciously. The development and adaptation of motivation, behavior and new competencies to the new technological resources for example, are increasingly important for students to flexibly and autonomously self-regulate their learning. Competencies, skills and strategies can be practiced through resources and amplified learning spaces that enable the achievement of personal and learning objectives. Hence, it is crucial that researchers and teachers invest in modernizing teaching practices and environments that enable regulatory processes to develop. Students need to be prepare for the jobs of the 21st century that require new competencies and the latter should be developed from early on (Dede, 2010). We feel that this investigation brings an important contribution to learning in modern learning environments even if it serves as an example as to how it is possible to promote conscious and meaningful learning.

The Organization for Economic Co-cooperation and Development (OECD) defined competencies (2013) in the Definition and Selection of Competencies (DeSeCo), as the activation and organization of cognitive and practical knowledge, social and behavioral skills such as attitudes, emotions, and motivations/values, as well as the ability to accomplish multifaceted challenges by using those skills in a specific environment successfully (Rychen & Salganik, 2003). These competencies contain the same elements as the European Union's definition which implies the application of life-long learning such as effective information processing, communication, collaboration, digital literacy, critical and creative thinking, problem solving, and self-regulated learning skills (European Commission, 2012). The Framework for a European Test to Measure Learning to Learn (Fredriksson & Hoskins, 2008) for instance, has indicated fundamental aspects that must be included when measuring the regulation of learning, and which we have considered in this investigation. Specifically, they have mentioned dimensions, such as affect (i.e. including learning motivation, learning

strategies and orientation towards change; academic self-concept and self-esteem; learning environment), cognition (identifying demands, and using mental tools) and metacognition (i.e. metacognitive monitoring tasks, metacognitive accuracy and metacognitive confidence).

The Network on Education Systems and Policies in Europe (European Commission/EACEA/Eurydice, 2013) has revealed that individuals with higher education degrees join the job market twice as much as those with lower qualifications. Furthermore, the European Centre for the Development of Vocational Training (2010) has clearly stated that there is an increasing demand for individuals to have more skills and competencies that will enable them to enter the 21st century job market successfully. What's more, positions that once required individuals with lower skills and competencies, are now searching for individuals with more qualifications. In Portugal in particular, the increase in unemployment in recent years has affected individuals differently, depending on their level of education (OECD, 2013). That is, the lower the level of education, the higher the possibility of being unemployed. Thus, the need to invest in students' education in order to improve their competencies and skills in a meaningful way. In order to implement the development of these competencies and skills, meaningful learning opportunities, such as the ones presented in this investigation, can be further studied in new and existing domain-areas, as cross-curricular in schools, which must be increasingly viewed as flexible learning organizations. Modern times call for modern measures. Contemporary education entails continuous strategic acquisition and management of available information through various means and languages. Thus, learning to plan, monitor and evaluate stimulates students' autonomy and ability to consciously make decisions in their life-long learning.

In the end, I interviewed the students (experimental group) and the teacher participating in this investigation from study three, about how they felt about this entire experience and whether it had affected them somehow. Although I did not include this data in

the general findings, it helped me understand whether or not the students and the teacher had found this learning experience meaningful and whether they had benefitted from it. There words are pretty explanatory. Hence, to exemplify the students and the teacher's responses, I present just a few examples of how they perceived this learning experience:

"I felt happy. I felt I had learned something that I had never learned before. Lastly, I also felt that these classes helped me with my English for when I go to London this summer. Now I know better." (Al)

"I felt very good because firstly, I had the help I needed and secondly, because I could do what I wanted and didn't want to do." (Bea)

"I felt happy because I didn't have to read about a sport I didn't like. I could choose and the teacher trusted me to choose," (Leo)

"The teacher gave me the freedom to choose what I wanted. I felt that I was able to do things on my own If I wanted and that I would be successful. She trusted us." (Neu)

"I learned with my colleague. It was fun. She taught me words I didn't know." (Hu)

"I think it's essential to explain things explicitly to them. They have an intuitive notion of how to do things. But verbalizing is very important. It was important to teach learning strategies and processes explicitly. It's really useful... They were so motivated. They didn't want classes to end. They kept asking me when they were going to end because they didn't want them to end. It was a really positive experience for all of us. I would love to continue working with these tools and methods." (Teacher)

Ultimately in a last moment of this investigation, these interviews also helped me put my own learning path into perspective. Did I learn anything? Would I do it again? Was it meaningful for me? Yes.

"Today's world of accelerated social, informational, and technological changes with instant communicative access worldwide provides people with expanded opportunities to bring their influence to bear on events that affect their lives. The exercise of individual and collective agency is contributing increasingly, in virtually every sphere of life, to human development, adaptation, and change. At the broader social level, the challenges center on how to enlist these agentic human capabilities in ways that shape a better future."

(Bandura, 2006, p.177)

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APPENDIX A

AUTHORIZATION FROM THE MINISTRY OF EDUCATION TO IMPLEMENT QUESTIONNAIRES IN SCHOOLS

2010/12/16 <mime-noreply@gepe.min-edu.pt>

Exmo(a)s. Sr(a)s.

O pedido de autorização do inquérito n.º 0145400004, com a designação *CATOM / DOGSRL - Escalas de Aprendizagem Auto-regulada no Ensino Básico - versão do aluno*, registado em 18-11-2010, foi aprovado.

Avaliação do inquérito:

Exmo(a). Senhor(a) Dr(a) Paula da Costa Ferreira

Venho por este meio informar que o pedido de realização de questionário em meio escolar é autorizado uma vez que, submetido a análise, cumpre os requisitos de qualidade técnica e metodológica para tal devendo, no entanto, ter em atenção as observações aduzidas.

Com os melhores cumprimentos

Isabel Oliveira

Directora de Serviços de Inovação Educativa

DGIDC

Observações:

1 – O questionário deve conter uma breve introdução para informar os respondentes sobre os objectivos e propósitos da sua administração.

2 – O Questionário deve conter um agradecimento final aos respondentes

3 – Em vez de género, que é um conceito, sugere-se que se caracterize os inquiridos pelo sexo, que é o atributo que se pretende conhecer

Pode consultar na Internet toda a informação referente a este pedido no endereço http://mime.gepe.min-edu.pt. Para tal terá de se autenticar fornecendo os dados de acesso da entidade.

APPENDIX B

INTERVIEW QUESTIONS FOR STUDENTS ABOUT DIARY TASK USE AND EXAMPLE RESPONSES (STUDY 2)

What do you think of using the diary task? Do you think you did well? What would you change?

1. "Well, we did the diary at the beginning and end of the class, we did it every day and had limited time to do it, but I think the diary was good... was funny . and cute. Actually, what I liked most was responding to those little crosses because in the beginning I didn't know what to write in the other questions. I started to think what I wanted to write, what I learned... and in the end, I began to organize what to write in order... I started writing things like new words I had learned and latter I wrote the words and how I had been able say them to learn. I guess I could improve. I could do better. " (student in the experimental group)
2. " In the beginning I thought it was boring because we had gym class before English class and we had to just start writing in the diary. But then I liked it because we could give our opinion on what we liked to do in the classroom. I guess I could improve my handwriting and writing ... the type of sentence." (student in the experimental group)
3. "Yes . I enjoyed my diary. I had never had a diary like that and I've had many diaries. But this is a learning diary and I think it was good because most of my colleagues... well, we started to prepare our work, we knew what we had to do. I could improve with more practice. " (student in the experimental group)
4. " At first I also thought that the diary was not very cool, but then it was nice and I had the chance to be honest with what I think. In the beginning, even if the bell rang, we had to stay there to do our diary. I guess I should have had more time to think better. I could have improved with more complete answers. Latter, I had more practice and it was okay." (student in the experimental group)
5. "In most classes, we came running in and making noise and then had to calm down and complete the diary. It made us concentrate. I had had a diary before, but never one like that, it's an informative diary. With this diary, I know my job, how I did , what I did ... "(student in the experimental group)
6. " It forces you to be more honest. Helps us see what we did wrong or if we were able to finish our assignments." (student in the control group)
7. " I think the diary is interesting. It has many questions and at the end, the last question ... what I did was I sometimes got a little messed up because some of my colleagues began making noise and I would look at the board to see if it gave me some idea of what the teacher wrote. I guess I could have done better if I was more concentrated with less noise. " (student in the control group)
8. " First I thought it was a normal diary like any other, but then I realized it was a way for the teacher to know what we thought of the English lessons. That was very nice." (student in the control group)
9. "It's good to correct our work, to say what we did in class." (student in the control group)
10. " I think it was interesting to do, but for me it was difficult to answer the first question because I didn't know what I wanted to learn because usually the teachers are always the ones who choose what we will do."(student in the control group)

APPENDIX C

FREQUENCIES AND EXAMPLES OF STUDENTS' RESPONSES TO THE OPEN-ENDED QUESTIONS IN THE PRE-TEST AND POSTTEST (STUDY 2)

Open-ended Questions and Rating Scale (types of comments)	Group	%	Examples of Comments in the Pre-test
Open-ended Question 1	Today in my class I want to learn...		
1. irrelevant comments	EG	--	--
	CG	--	--
2. general comments related to assigned goals about content	EG	7.5%	"Today I want to learn what the teacher will teach."
	CG	33.3%	"Today I want to learn what's on the board."
3. specific comments related to assigned goals about content	EG	12.5%	"Today I want to learn what the teacher will show us about the Olympics."
	CG	16.7%	"Today I want to learn what the teacher will teach about grammar."
4. general comments related to autonomous goals about content	EG	55%	"Today I want to learn to speak and write in English."
	CG	21.7%	"Today I want to learn to write texts in English."
5. specific comments related to autonomous goals about content	EG	17.5%	"Today I want to learn to say words like 'court' and 'like' in English."
	CG	20%	"Today I want to learn about typical sports in English-speaking countries."
6. general comments related to assigned goals about strategies to adopt to learn content	EG	--	--
	CG	1.7%	"Today I want to learn to do what the teacher wrote on the board about self-evaluation."
7. specific comments related to assigned goals about strategies to adopt to learn content	EG	--	--
	CG	1.7%	"Today I want to learn what the teacher will show us about how she solves problems like translate words into English."
8. general comments related to autonomous goals about strategies to adopt to learn content	EG	7.5%	"Today I want to learn to plan my work."
	CG	3.3%	"Today I want to learn to work faster."
9. specific comments related to autonomous goals about strategies to adopt to learn content	EG	--	--
	CG	1.7%	"Today I want to learn why I should underline my text to understand it."
Open-ended Question 2	Today in my class I will be able to...		
1. irrelevant comments	EG	--	--
	CG	1.7%	"Today in my class I will be able to do nothing."
2. general comments about anticipations related to grades	EG	2.5%	"Today in my class I will be able to get a good grade."
	CG	6.7%	"Today in my class I will be able to get good grades on tests."
3. specific comments about anticipations related to grades	EG	--	--
	CG	--	--
4. general comments about anticipations related to content	EG	65%	"Today in my class I will be able to know all the words."

5. specific comments about anticipations related to content	CG	46.7%	"Today in my class I will be able to write in English."
	EG	12.5%	"Today in my class I will be able to learn about the objects we need for swimming and how to say them in English."
	CG	31.7%	"Today in my class I will be able to say the names of our muscles in English."
6. general comments about anticipations related to strategies to adopt to learn content	EG	20%	"Today in my class I will be able to follow all of the steps to learn."
	CG	10%	"Today in my class I will be able to pay attention."
7. specific comments about anticipations related to strategies to adopt to learn content	EG	--	--
	CG	3.3%	"Today in my class I will be able to complete my reading alone during class time."
Open-ended Question 3	Today in my class I learned...		
1. irrelevant comments	EG	--	--
	CG	3.3	"Today in my class I learned nothing."
2. general descriptions about content	EG	7.5%	"Today in my class I learned new words."
	CG	26.7%	"Today in my class I learned English."
3. specific descriptions about content	EG	55%	"Today in my class I learned what swimming is in English."
	CG	41.7%	"Today in my class I learned to do crossword puzzles in English."
4. general comments related to cognitive and/or affective reflections about content	EG	--	--
	CG	8.3%	"Today in my class I learned that my assignments were nice."
5. specific comments related to cognitive and/or affective reflections about content	EG	2.5%	"Today in my class I learned to say English words correctly, such as "like".
	CG	3.3%	"Today in my class I learned to do a funny word search in English."
6. general comments related to cognitive and/or affective reflections about strategies used to learn content	EG	27.5%	"Today in my class I learned to something new. To prepare my work."
	CG	11.7%	"Today in my class I learned that it's nice to work hard in class."
7. specific comments related to cognitive and/or affective reflections about strategies used to learn content	EG	7.5%	"Today in my class I learned to go to the dictionary to the word paddle."
	CG	5%	"Today in my class I learned to say what I was able and not able to do in class, like repeating the word swimming."

Note: Frequencies were based on each group's responses separately to equal a total of 100% for each question separately. To exemplify, out of 100% of the experimental group's responses to question 1 in the pre-test, 55% of the responses were considered general comments related to assigned goals about content.

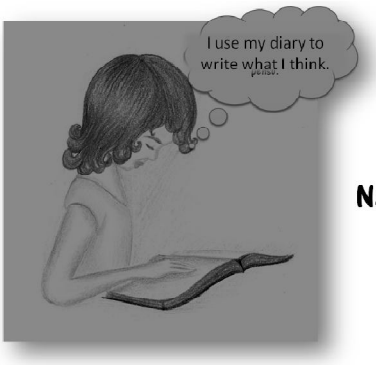
Open-ended Questions and Rating Scale (types of comments)	Group	%	Examples of Comments in the Posttest
Open-ended Question 1	Today in my class I want to learn...		
1. irrelevant comments	EG	--	
	CG	--	
2. general comments related to assigned goals about content	EG	5%	"Today I want to learn what the teacher has for me."
	CG	30%	"Today I want to learn what the teacher teaches in English."
3. specific comments related to assigned goals about content	EG	2.5%	"Today I want to learn what the teacher said about working and talking in English."
	CG	40%	"Today I want to learn what's on the board about water sports."
4. general comments related to autonomous goals about content	EG	32.5%	"Today I want to learn about football words."
	CG	16.7%	"Today I want to learn about English words."
5. specific comments related to autonomous goals about content	EG	22.5%	"Today I want to learn how to ask questions in English about sports."
	CG	11.7%	"Today I want to learn to say the sports professions in English."
6. general comments related to assigned goals about strategies to adopt to learn content	EG	--	--
	CG	--	--
7. specific comments related to assigned goals about strategies to adopt to learn content	EG	--	--
	CG	--	--
8. general comments related to autonomous goals about strategies to adopt to learn content	EG	30%	"Today I want to learn strategies that help me learn new words."
	CG	1.7%	"Today I want to learn to pay attention in class to learn the story."
9. specific comments related to autonomous goals about strategies to adopt to learn content	EG	7.5%	"Today I want to learn how to pronounce new words in English about tennis, like court by reading the story many times."
	CG	--	--
Open-ended Question 2	Today in my class I will be able to...		
1. irrelevant comments	EG	--	--
	CG	--	--
2. general comments about anticipations related to grades	EG	--	--
	CG	1.7%	"Today in my class I will be able to get a good grade."
3. specific comments about anticipations related to grades	EG	--	--

4. general comments about anticipations related to content	CG	1.7%	"Today in my class I will be able to get blue sticker for good performance."
	EG	10%	"Today in my class I will be able to learn new words in English."
	CG	48.3%	"Today in my class I will be able to do everything."
5. specific comments about anticipations related to content	EG	12.5%	"Today in my class I will be able to describe the story and say "He likes to play tennis."
	CG	16.7%	"Today in my class I will be able to read the story with good pronunciation."
6. general comments about anticipations related to strategies to adopt to learn content	EG	62.5%	"Today in my class I will be able to overcome my obstacles to learn."
	CG	26%	"Today in my class I will be able to do all my work on time correctly."
7. specific comments about anticipations related to strategies to adopt to learn content	EG	15%	"Today in my class I will be able to evaluate my work better by reading the story and my answers many times."
	CG	5%	"Today in my class I will be able to say all of the vocabulary in the story without asking my teacher for help."
Open-ended Question 3	Today in my class I learned...		
1. irrelevant comments	EG	--	--
	CG	--	--
2. general descriptions about content	EG	--	--
	CG	36.7%	"Today in my class I learned some words."
3. specific descriptions about content	EG	--	--
	CG	38.3%	"Today in my class I learned about adjectives."
4. general comments related to cognitive and/or affective reflections about content	EG	--	--
	CG	10%	"Today in my class I learned some nice words in English that I liked."
5. specific comments related to cognitive and/or affective reflections about content	EG	7.5%	"Today in my class I learned to say the words about football and it was fun."
	CG	3.3%	"Today in my class I learned about and the lyrics I liked in songs we sang about sports."
6. general comments related to cognitive and/or affective reflections about strategies used to learn content	EG	55%	"Today in my class I learned to learn the story with my colleagues."
	CG	10%	"Today in my class I learned to correct my work but it was difficult."
7. specific comments related to cognitive and/or affective reflections about strategies used to learn content	EG	37.5%	"Today in my class I learned to express what I think about my class. It was fun to work together with my colleagues and I learned to be honest with what I write down."
	CG	1.7%	"Today in my class I learned that being able to distinguish between my language and English by reading the translation is very important."

Note: Frequencies were based on each group's responses separately to equal a total of 100% for each question separately. To exemplify, out of 100% of the experimental group's responses to question 1 in the pre-test, 32.5% of the responses were considered general comments related to assigned goals about content.

APPENDIX D

THE DIARY TASK: DIARY OF GUIDED SELF-REGULATED LEARNING (STUDY 3)



My Diary

Name: _____

Today in my class I want to learn

_____

Today in my class I will be able to

_____

Did I plan my work in class today?

No	Yes				
0	How? _____	Not at all	A little	Enough	A lot
	I liked to plan my work.	1	2	3	4
	I found it difficult to plan my work.	1	2	3	4
	I made an effort to plan my work.	1	2	3	4
	I was able to plan my work.	1	2	3	4

Did I correct my work as I did it in class today?

No	Yes				
0	How? _____	Not at all	A little	Enough	A lot
	I liked to correct my work as I did it.	1	2	3	4
	I found it difficult to correct my work as I did it.	1	2	3	4
	I made an effort to correct my work as I did it.	1	2	3	4
	I was able to correct my work as I did it.	1	2	3	4

Did I evaluate my work in class today?

No	Yes				
0	How? _____	Not at all	A little	Enough	A lot
	I liked to evaluate my work.	1	2	3	4
	I found it difficult to evaluate my work.	1	2	3	4
	I made an effort to evaluate my work.	1	2	3	4
	I was able to evaluate my work.	1	2	3	4

Today in my class I learned

_____

_____

APPENDIX E

DESCRIPTION OF THE TRAINING LESSONS (STUDY 3)

Lessons 1 and 2: Introduction to the CSCL environment and its content

In the first two lessons we introduced the students to the Moodle Platform. Specifically, we allowed students to experiment with a demonstration lesson on the computer so that they could be familiar with the different icons and exercise options. We also introduced self-regulated learning as an autonomous, but guided way of using strategies to learn. Initial doubts regarding the platform and the diary task were also clarified.

Lessons 3 and 4: strategic planning and setting objectives to practice water sports.

In lesson 3 the teacher presented different images, which represented objectives, following instructions and preparing work/planning. A classroom discussion was established where the teacher clarified doubts. These images were placed on the wall. Then the students began working on their computer and visualized a video sketch about a character (Bernard) practicing water sports. Some students chose the video on canoeing, while others chose swimming. After students saw the video, they did an activity that focused on identifying Bernard's objectives and decisions made in order to prepare for this sport. Lastly, the students elaborated a plan to help Bernard achieve his objectives.

In lesson 4 the students received feedback from and corresponded with Mr. English, a character that provided systematic feedback to students regarding their performance in terms of content and strategy use. Then, the teacher reviewed the concepts objectives, following instructions and preparing work/planning. She asked students concept questions in order to verify if they remembered what they had learned in the previous lesson. The teacher then asked students to think about their plan from their previous lesson in order to help Bernard perform better in that particular sport. Students had to then imagine they were going to practice that sport and type on the computer how they would prepare for it. Lastly, an open class discussion was held so students could reflect as a group about their plans.

Lessons 5 and 6: self-motivation/efficacy beliefs and task interest in indoor sports

In lesson 5 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. The teacher discussed the concept images from the previous two lessons and presented new images representing "likes to...", "can..." and "responsibility". These images were hung on the wall next to the other concept images. The students began watching and listening to a video of their choice on their computers. The videos were related to the concepts that were discussed with the teacher, as well as the topic on indoor sports, such as, basketball and ping pong. Then students worked on an activity where they identified Bernard's objectives and decisions in order to prepare for the game, as well as focused on what the character thought he could do and if he liked to play that particular sport. Students had the option of working together. Latter, the students practiced recording their narration of the video and monitoring their work by listening to themselves and their colleagues (optional).

In lesson 6 the teacher reviewed the concept images from the previous lessons and clarified doubts. The students then received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher introduced students to making an oral critique. Students had the option of watching the video from lesson 5 if they found it necessary and record their narration again. From here, students proceeded to plan and elaborate an oral critique of the video they had watched in lesson 5. They had to resume the sketch and express what they liked and didn't like about

the story. In the end, students had to write down whether they had liked their critique and why. Students also used the glossary to help them with their vocabulary for the oral critique. Again, students had the option of working together and either making a critique together or assessing each other's critiques of the video.

Lessons 7 and 8: Self-observation/control and attention focusing in velocity sports

In lesson 7 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher reviewed past concepts and presented concepts, such as "attention/concentration"; "revising one's own work"; and "knowing new ways of learning". These concepts were placed on the wall next to the other concept images. students began watching and listening to a video of their choice on their computers. The videos were related to the concepts that were discussed with the teacher, as well as the topic on velocity sports, including car racing and cycling. The activity following the video focused on identifying the character's objectives and the decisions he made in order to prepare for his sport. It also focused on what that character thought he could do as well as what he liked to do. Lastly, this activity highlighted aspects dealing with how Bernard concentrated and corrected his mistakes. After this activity, there was a class discussion about how Bernard could have done things differently and how the students could find alternative strategies to win a car or bicycle race. The discussion also focused on how students could find alternative strategies when they were experiencing difficulties. Latter, the students practiced recording their narration of the video and monitoring their work by listening to themselves and their colleagues (optional).

In lesson 8 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher reviewed past concepts and presented concepts, such as "obstacles" and "strategies". The teacher answered students' questions and the students got the option to record their narration again from the previous class and do a true and false activity on car racing and cycling. This activity focused on obstacles and using strategies to overcome them. This exercises also focused on remembering strategies. Students could work together to remember the obstacles together and come up with solutions together to overcome those obstacles. Then, students interviewed a colleague about their interest in these sports, whether they get distracted when they practice them and what they do in order to concentrate. Lastly, these questions were asked about their English class.

Lessons 9 and 10: Self-judgment and evaluation in bravery sports

In lesson 9 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher reviewed past concepts and presented concepts including self-evaluation. Student questions were answered. Then, the chose to watch a video on bravery sports, namely, fencing or judo, which the students could choose to watch in pairs. The activity following the video was a multiple choice exercise focusing on identifying Bernard's objectives and the decisions he made in order to prepare for his sport. It also focused on whether Bernard thought he could do and liked to do the sport. This activity also highlighted aspects dealing with how Bernard concentrated and told himself to keep going. Lastly, the exercise dealt with how Bernard evaluated the outcomes of his combat. Furthermore, students worked together to record their narrations of the video and subsequently, interviewed each other about their interest in these sports.

In lesson, 10 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher

reviewed past concepts and answered students' questions. In this lesson, students had the option of reviewing the video they chose to watch in lesson 9. They could also use the glossary to create a story with their partner, which would allow them to focus on how to approach an activity collaboratively and share self-motivation beliefs, attention focusing and self-instruction, and lastly, self-evaluation. Collaboration was optional. Students could choose to work alone. The story had to be about two children practicing bravery sports and the steps they had to take in order to overcome difficulties and win the match, as well as how they would celebrate if they won. Lastly, students had to reflect about what they liked/ didn't like about their story.

Lessons 11 and 12: Self-reaction and defense/adaptive mechanisms in hit and kick sports

In lesson 11, students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher reviewed past concepts and answered students' questions. The students then watched a video sketch about hit and kick sports, namely, football and tennis, which students chose to watch individually or in pairs. The post-video activity was a multiple choice activity which reviewed all of the regulated learning strategy concepts that were reviewed, including responsibility over outcomes, as well as the vocabulary on these sports. At the end, students spoke in an open-class discussion about how they did in the activity. Lastly, students recorded their narration of the video (optionally in pairs) and monitored and evaluated it individually or in pairs.

In lesson 11, students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. Then, the teacher reviewed past concepts and answered the students' questions. The teacher and students recalled what had happened in the previous videos. Then, they had to practice narrating the story alone or collaboratively until they thought they did so fluently. Hence, they had to write down a strategy plan of what they were going to do in order to get a perfect result. After reading it, they had to evaluate their work by answering questions such as: "Do I/we have to concentrate more?"; "Am I/Are we following my/our plan?"; "Do I/we have to ask for help?"; "Do I/we have to read louder?"; "Did I/we speak well about the sport?"; "Am I/Are we happy with my narration?"; "Do I/we want to read it again before showing my colleague?" If they worked individually, the next step was to share the narration with a colleague and get their feedback on the reading. They could redo the narration with their colleague. The question "What could your colleague/we have done differently?" guided the conversation between students.

In lesson 12 students received feedback from and corresponded with Mr. English again regarding their performance in terms of content and strategy use. The teacher discussed with students how they could work individually or in pairs in order to do the narration of their videos, monitor their performance and correct their mistakes in order to foster collaborative behavior. The teacher also challenged the students to rehearse the video various times and try to narrate it without the subtitles.

APPENDIX F

FREQUENCIES AND EXAMPLES OF STUDENTS' RESPONSES TO THE OPEN-ENDED QUESTIONS IN THE PRE-TEST AND POSTTEST (STUDY 3)

Open-ended Questions and Rating Scale (types of comments)	Group	% Pre-test	% Posttest	Examples of Comments
Open-ended Question 1				Today in my class I want to learn...
1. irrelevant comments	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
2. general comments related to assigned goals about content	EG	14.3%	--	"Today I want to learn what the teacher will bring."
	CG1	6.3%	12.5%	"Today I want to learn what the teacher will order us to do."
	CG2	--	--	
3. specific comments related to assigned goals about content	EG	21.4%	--	"Today I want to learn the new videos the teacher will give us."
	CG1	12.5%	6.3%	"Today I want to learn what the teacher has fir us about the Olympics."
	CG2	--	7.1%	"Today I want to learn how to do the ditto my teacher will give me."
4. general comments related to autonomous goals about content	EG	50%	7.1%	"Today I want to learn more about the new English platform."
	CG1	56.3%	31.3%	"Today I want to learn how to ask many questions in English."
	CG2	42.9%	42.9%	"Today I want to learn to draw all of the sports."
5. specific comments related to autonomous goals about content	EG	--	28.6%	"Today I want to learn how to say 'strategy' in English."
	CG1	25%	25%	"Today I want to learn about swimming objects in English."
	CG2	50%	50%	"Today I want to learn to say the name of the sports' countries."
6. general comments related to assigned goals about strategies to adopt to learn content	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
7. specific comments related to assigned goals about strategies to adopt to learn content	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
8. general comments related to autonomous goals about strategies to adopt to learn content	EG	14.3%	42.9%	"Today I want to learn to evaluate my work."
	CG1	--	25%	"Today I want to learn to correct my work as I do it."
	CG2	--	--	
9. specific comments related to autonomous goals about strategies to adopt to learn content	EG	--	21.4%	"Today I want to learn to correct my pronunciation by listening to my recording many times."
	CG1	--	--	--
	CG2	7.1%	--	"Today I want to learn how to underline my text about football."
Open-ended Question 2				Today in my class I will be able to...

1. irrelevant comments	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
2. general comments about anticipations related to grades	EG	--	--	--
	CG1	6.3%	--	"Today in my class I will be able to get a good grade on my exercises."
	CG2	7.1%	--	"Today in my class I will be able to get good grades on my assignments."
3. specific comments about anticipations related to grades	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
4. general comments about anticipations related to content	EG	92.9%	7.1%	"Today in my class I will be able to know all about sports."
	CG1	50%	6.3%	"Today in my class I will be able to speak about sports."
	CG2	50%	28.6%	"Today in my class I will be able to read in English."
5. specific comments about anticipations related to content	EG	--	7.1%	"Today in my class I will be able to say 'He likes to go canoeing'."
	CG1	12.5%	18.8	"Today in my class I will be able to write a complete sentence about sports."
	CG2	21.4%	28.6%	"Today in my class I will be able to say the names of the uniforms."
6. general comments about anticipations related to strategies to adopt to learn content	EG	7.1%	42.9%	"Today in my class I will be able to monitor my English accent more."
	CG1	31.3%	75%	"Today in my class I will be able to think about a strategy."
	CG2	14.3%	21.4%	"Today in my class I will be able to finish my work."
7. specific comments about anticipations related to strategies to adopt to learn content	EG	--	42.9%	"Today in my class I will be able to have a strategy for each problem."
	CG1	--	--	
	CG2	7.1%	21.4%	"Today in my class I will be able to listen carefully to the reading and repeat what I heard."
Open-ended Question 3				Today in my class I learned...
1. irrelevant comments	EG	--	--	--
	CG1	--	--	--
	CG2	--	--	--
2. general descriptions about content	EG	14.3%	--	"Today in my class I learned a lot of words."
	CG1	6.3%	--	"Today in my class I learned English words."
	CG2	42.9%	14.3%	"Today in my class I learned to read English."
3. specific descriptions about content	EG	28.6%	--	"Today in my class I learned to use the platform icons."
	CG1	68.8%	--	"Today in my class I learned to say 'canoeing'."
	CG2	28.6%	28.6%	"Today in my class I learned how to do a puzzle in English about swimming."

4. general comments related to cognitive and/or affective reflections about content	EG	--	--	--
	CG1	--	--	--
	CG2	7.1%	14.3%	"Today in my class I learned to read English better than before."
5. specific comments related to cognitive and/or affective reflections about content	EG	--	--	--
	CG1	--	6.3%	"Today in my class I learned pronounce canoeing correctly."
	CG2	7.1%	14.3%	
6. general comments related to cognitive and/or affective reflections about strategies used to learn content	EG	35.7%	50%	"Today in my class I learned how to evaluate my colleague's work."
	CG1	25%	62.5%	"Today in my class I learned that I can learn with my colleagues."
	CG2	7.1%	21.4%	" Today in my class I learned that I can learn to pay attention."
7. specific comments related to cognitive and/or affective reflections about strategies used to learn content	EG	21.4%	50%	"Today in my class I learned to judge the recording I made with my colleague by talking to him about it."
	CG1	--	31.3%	"Today in my class I learned that I have to be honest with myself and tell my colleagues what I like and don't like about our work."
	CG2	7.1%	7.1%	"Today in my class I learned that sometimes it's important to translate into my language so I can understand the text I want to read like today."

Note: Frequencies were based on each group's responses separately to equal a total of 100% for each question separately. To exemplify, out of 100% of the experimental group's responses to question 1 in the pre-test, 14.3% of the responses were considered general comments related to assigned goals about content.