

# Learning for a Summative Assessment: The Relationship between Students' Academic Achievement and Self-Regulated Learning

Jeroen van der Linden<sup>1,2\*</sup> , Tamara van Schilt-Mol<sup>2</sup>, Loek Nieuwenhuis<sup>2,3</sup>, Cees van der Vleuten<sup>1</sup>

<sup>1</sup>Department of Educational Development and Research in the Faculty of Health, Medicine and Life Sciences, Maastricht University, Maastricht, The Netherlands

<sup>2</sup>School of Education, HAN University of Applied Sciences, Nijmegen, The Netherlands

<sup>3</sup>Department of Psychology and Educational Sciences, Open University, Heerlen, The Netherlands

Email: \*J.vanderLinden@maastrichtuniversity.nl

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## Abstract

Recent studies show that students applying appropriate self-regulated learning strategies (SRL) are more successful in their academic achievements (AA). However, the relation between SRL and AA is complex. There is evidence that not all SRL strategies contribute equally to AA. A greater understanding of the relationship between students' SRL strategies and AA can help indicate differences between students. Interviews were conducted to study the relationship between the SRL strategies students use when learning for an achievement test and the resulting AA. Two main aspects that influence this relationship were identified: students' goal approach, and with this approach, the amount of effort they put into learning, and the deliberateness of using SRL strategies. These aspects address the complex relationship between SRL and AA. From these results we present different student types, based on these aspects found. Suggestions for future research are done to utilise and further explore these student types.

## Keywords

Assessment, Self-Regulated Learning, Monitoring Learning

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## 1. Introduction

Educational psychology has generated a lot of findings on factors that relate to academic achievement (AA) (Winne & Nesbit, 2010). AA is usually determined by summative classroom tests aimed at measuring the cognitive component of

education (Broekkamp & Van Hout-Wolters, 2007; Miller, 1990; Schuwirth & Van der Vleuten, 2011; van der Linden, 2020) and often expressed in grades (Dent & Koenka, 2016; Kitsantas & Zimmerman, 2008; Kitsantas et al., 2008; Ohtani & Hisasaka, 2018; Sperling et al., 2010; Young & Fry, 2012). However, for students to improve learning and effectively ensure their AA, they must be able to self-regulate their learning activities (Boekaerts, 1999; Boekaerts & Corno, 2005; Wang et al., 1990). Considerable research has shown that Self-Regulated Learning (SRL) is related to AA (Boekaerts & Corno, 2005; Dent & Koenka, 2016; Schunk & Zimmerman, 2006; Vermunt, 2005; Virtanen et al., 2015; Wang et al., 1990; Wang et al., 1993; Winne, Philip, & Hadwin, 1998).

To define SRL, various models and different definitions of SRL from a variety of different theoretical perspectives can be used. Common to these definitions is that students use both cognitive and metacognitive strategies to control and regulate their learning (Pintrich, 1999). When students learn, they regulate areas of cognition, motivation, behaviour and context to control their learning activities and the learning environment (Pintrich, 2000). Embodiments of SRL strategies include selecting and adapting cognitive strategies for learning, like organising information, rehearsing learning subjects, providing meaning to subjects, summarizing, and notetaking (Pintrich, 2000; Schunk & Zimmerman, 2012). Key to SRL definitions is the deliberate control taken by students in their activities (Pintrich, 1999), that controlling SRL strategies is goal directed (Pintrich, 2000), and that this control is not constant, but dependent on the specific learning context (Butler et al., 2017).

SRL matches the notion that, to effectively become successful in AA, a certain amount of control of SRL strategies is needed (Azevedo, 2018; Boekaerts, 1999; Butler et al., 2017; Lichtinger & Kaplan, 2011; Nicol & Macfarlane-Dick, 2006; Pintrich, 2000; Pintrich, 2002; Sadler, 1989; Schunk & Zimmerman, 2012; Wang et al., 1990; Zimmerman, 2002). For example, Heikkilä et al. showed that students that deliberately applied SRL strategies received the highest grades (Heikkilä et al., 2012). Moreover, research indicates that certain learning strategies like a deep learning approach (Diseth et al., 2010) are found in students with high grades (Heikkilä & Lonka, 2006). Research therefore indicates that students must be able to use SRL effectively to improve their learning (Sadler, 1989).

Although the relation between the deliberate use of SRL strategies and AA is evident, there is also evidence that not all embodiments of SRL relate to AA in the same manner (Kitsantas et al., 2008; Phan, 2010) and that this relationship is rather complex (Ben-Eliyahu & Bernacki, 2015). This complexity was demonstrated by Ablard and Lipschultz (1998), for example. Their findings show that students with high grades can range widely in their use of SRL strategies, so they can achieve the same grade when deploying and controlling different SRL strategies. Phan (2010) demonstrated that surface processing strategies, as part of cognitive strategies, exerted a negative effect on AA. More recently, Virtanen et al. (2015) demonstrated that AA relates slightly and negatively to a learner's belief about his or her ability to perform the task, a part of motivational control. Van

der Linden and Kiewiet (2016) showed that there were no correlations with high grades and certain SRL strategies like organisational strategies and effort regulation. However, these correlations were found with students who passed at their first sit. This indicates that, even though AA is often expressed as grades (Dent & Koenka, 2016; Kitsantas & Zimmerman, 2008; Kitsantas et al., 2008; Ohtani & Hisasaka, 2018; Sperling et al., 2010; Young & Fry, 2012), these grades themselves do not carry information about the effectiveness of the SRL strategies used (Sadler, 1989), nor about the way the SRL strategies are related to grades (Ablard & Lipschultz, 1998). Since AA mostly aims at measuring the cognitive component of education (Broekkamp & Van Hout-Wolters, 2007; Miller, 1990; Schuwirth & Van der Vleuten, 2011; van der Linden, 2020), the grades do not inform the students about how to improve their learning, which SRL strategies to use, and how to control these strategies.

Although the topic of SRL has been intensively researched (Ben-Eliyahu & Bernacki, 2015; Winne & Nesbit, 2010), students can benefit from a greater understanding of the relationship between the deployment of SRL strategies and AA, because this would allow them to develop and use SRL strategies more effectively (Schunk & Zimmerman, 2012; Van Loon, 2014). Foster et al. stated that “research that attempts to better understand the bases of students’ exam predictions may ultimately inform how to improve overall student achievement” (Foster et al., 2017). This is in line with Van Loon (2014), who advises researchers to investigate how regulation is related to achievement. Research findings which indicate that many students seem to lack effective SRL strategies and therefore do not study effectively, underline this importance (de Bruin et al., 2017; Heikkilä et al., 2012; Meusen-Beekman et al., 2015; van de Pol et al., 2019; Virtanen et al., 2015). Therefore, a better understanding of how students’ AA relates to the deliberate use of SRL strategies is needed.

In this study, we examine students’ study strategies to gain insights in the relationship between students’ AA and their use of SRL strategies. This is in order to empower students to develop and use more effective SRL strategies. The research findings can be used to develop supporting strategies to aid students in developing and deploying effective SRL strategies. The research question therefore is: What is the relationship between students’ AA and their use of SRL strategies?

The lead author JvdL assembled the research team based on the different roles and skills needed to gain insights in the relationship between SRL and AA and the chosen method. The research team consisted of four members, one with an MSc (JvdL), the rest with PhDs. All have responsibilities in educational programs. JvdL is both a researcher and a senior teacher educator and was not involved in lecturing the participants at that time. TvSM is a professor at a UAS. LN is a professor at two universities of education, and CvdV is a full professor in medical education. All authors are faculty members at Dutch universities. We are fully aware that working in these communities entails both interpretations

and assumptions. We discussed these interpretations and assumptions to prevent unsubstantiated claims.

## 2. Method

The current study contains a secondary qualitative analysis of data gathered about students' AA, their SRL skills, and the way they used and controlled SRL strategies while studying for an achievement test (van der Linden et al., 2020). In a previous study, we interviewed 18 students from a Dutch University of Applied Sciences (UAS) and transcribed the interviews. Students from this previous study originated from seven teacher-training programmes (e.g. biology, history, German) and participated in individual semi-structured interviews with a researcher lasting 42 to 68 minutes. Of those eighteen students, eight were male and ten were female. The students' average age was 21.8 years ( $SD = 1.96$ ). Fifteen students had completed senior general secondary education, while the other three had completed higher level vocational education.

The data resulting from the transcriptions were supplemented with information about attained grades and the results of a questionnaire about motivation and learning strategies. The students were interviewed about how they learned and controlled their learning when studying for an achievement test. The quantitative results from the questionnaire were used to address the appropriate topics in the interviews. The study was set in the second and third year of a teacher training program at a Dutch UAS with the exams of an Educational Sciences course as the learning context. We performed a Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991) because of its proven ability to gain insights in students' SRL abilities (Duncan & McKeachie, 2005; Pintrich et al., 1991). In this way we could highlight certain topics in the semi-structured interview guideline and measure the students' SRL abilities. To establish AA, transcripts from the school's grade system were collected before the interview to obtain students' grades from the Educational Sciences exams. The data from this study helped us answer the research question of our current study as student's information about their SRL strategy and attained grades of the achievement tests as a measure of AA are available.

With our intention of exploring deliberate learning, we only used grades from the first exam sits. The literature indicates that students with equal AA can use different self-regulated learning strategies, so to establish this relationship, we analysed the grades together with the qualitative data from the interviews.

The previous study used a purposive sampling strategy for the interviews. Students from the second and third year were sent an e-mail introducing the study and asking for their participation. Both second- and third-year students were approached because students in the second year and above have shown that they are able to gain a particular level of AA, in contrast to first-year students. Fourth-year students have their internships in the last year of the program and were therefore not invited. Eighteen students (eight male and ten female) from seven teacher educational programs (e.g. Biology, History, German) participated

in individual semi-structured interviews with a researcher, lasting 42 - 68 minutes. Average age of the students was 21.7 years (SD = 1.94). Fifteen students had completed secondary education, while three entered higher education (HE) with a background in vocational education.

The interviews started with a reflection by the participant on the outcome of the MSLQ to be able to go in depth on SRL in the interview. Following this, open-ended questions were used to examine participants' perspectives on SRL strategy use. Students were asked to describe learning experiences, including how, when and where learning had occurred (*How, when and where and with whom do you study?*), how they monitored their learning process (*how do you know when learning is sufficient? Can you establish this before the test?*), whether and how peers were involved, what learning strategy was used, what goals were pursued (*When have you learned enough for yourself and why?*), and whether or not these goals were achieved. Interviews in the previous study were recorded, transcribed verbatim, and any identifying data was then removed from the original transcripts. Aliases were given so that cases could be identified for use in the current study.

AA of students was derived from grades from the first sits of the Educational Sciences courses. The summative assessment system at this university entails that all courses end in an exam which students pass if they achieve a grade higher than 5.5 out of 1 - 10. All exams consisted of 40 multiple choice items. Grades were taken from the students' transcripts, and means and standard deviations were computed using SPSS version 22.

The interview data were analysed using template analysis (Brooks et al., 2014; Creswell, 2014) using Atlas-Ti 8. Pintrich's (2000: p. 454) model of phases and areas for SRL was used as an initial template. Initial analyses started with two transcripts: the transcripts were read in detail and emerging themes were identified. Next, the remaining transcriptions were analysed. A robust template was developed containing two main aspects: how students controlled their learning and the goals they set for themselves. With this coding scheme, we were able to thematically organise and classify the data.

### 3. Results

To better understand the relationship between the SRL strategies students used and the AA, the data were analysed. Two main aspects that influence this relationship were identified: students' goal approach, and with this approach the amount of effort they put in learning, and the deliberateness of using SLR strategies. These aspects could not be derived from the quantitative data, so a qualitative estimate was made based on the qualitative data from the interviews and the outcome of the template analysis. In the following section these aspects are further associated and discussed. The data used to gain insights in this complex relationship, the results of AA, our interpretation from the data of controlling SRL and the goal orientation, and the student characteristics, are presented in **Table 1**.

**Table 1.** Student characteristics, grades, control of SRL and goal orientation.

Alias	Gender	Education	M Grade first sits	SD Grade first sits	Control of SRL	Goal orientation
Anna	Female	History	6	1.12	no	Performance
Anton	Male	Biology	6.48	0.5	yes	Mastery
Belinda	Female	German	6.57	1	no	Mastery
Cees	Male	Biology	5.93	0.84	no	Performance
Emma	Female	German	8.27	0.64	yes	Mastery
Frederique	Female	Biology	6.73	1.37	no	Performance
Iris	Female	Biology	5.58	0.69	yes	Performance
Jade	Female	French	7.2	1.17	no	Mastery
Kirsten	Female	Biology	5.9	0.79	no	Performance
Maartje	Female	French	5.97	0.47	no	Mastery
Moniek	Female	German	7.23	1.21	no	Mastery
Neline	Female	Biology	6.57	0.87	yes	Mastery
Norbert	Male	Physics	6	0.72	no	Performance
Robert	Male	Physics	6.33	1.62	yes	Performance
Sander	Male	Biology	6.3	0.26	no	Performance
Thijs	Male	Biology	6.43	0.72	no	Mastery
Timo	Male	Economics	5.25	1.2	no	Performance
Tjerk	Male	Geography	5.13	0.62	no	Performance

### 3.1. Students' Goal Approach

All students want to be successful in their AA. What students do and how much effort they are willing to put into their education depends greatly on what they want to achieve, i.e., their goal approach. This goal approach has a profound impact on the choices made in SRL strategies. Roughly, two groups can be distinguished: students who want to pass the tests in order to obtain a degree, and students who want to obtain knowledge and skills to develop into good professionals. The first group of students, with a “passing the test” or performance goal approach, were not interested in high grades as long as they passed the test.

*Iris: A 6 is enough to get my diploma. The university actually says: we want you to get an 8, but if you get a 6, you will pass just as well.*

Students in this group differed in the way they think; for them simply passing the test is appropriate. Some felt that knowing 55% (the norm) is more than enough since “that’s what’s being asked and you forget most of the exam anyway”. Other students in this group were well aware that, in the long term, this was not a good way of learning, because it does not prepare them well for their future profession. This awareness, however, did not change their approach towards learning.

The second group, with a “professional development” or mastery goal ap-

proach, gave a more diverse picture. Students with high grades tend to be more aware of the value of the knowledge obtained from test preparation related to their professional life. They see that it is useful to know more beyond what is needed for a minimal grade because they think that their knowledge level should be higher than their future pupils' knowledge level.

*Emma: I think I always have to know a little bit more than my pupils, and besides that, I find it interesting. Because of that, I can respond to their questions. That basis also makes it easier for me to prepare the lessons later.*

Some students strive for high grades, beside their own learning goals, for example because they believe that a higher grade implies a higher retention rate.

*Kirsten: I think a 6 is really a very poor grade anyway. For me, under 6 is actually insufficient [...] because I think if I have a 6, then I have only half-learned it.*

From the above it becomes clear that students' goal approach is an important aspect of the relationship between SLR and AA. Therefore, a dichotomic estimate was made to which of the two groups students belonged. Students with a passing the test approach, recognisable by addressing a certain norm, were classified with a *performance* goal approach. Students with a more personal development interest, recognisable for instance by aiming for a high grade, were classified with a *mastery* goal approach.

### 3.2. Students' Deliberate Use of SRL Strategies

The main aspect influencing the way students used SRL strategies was their deployment deliberation and learning awareness. All students used SLR strategies in their learning throughout the course. The most common strategies were memorizing with extensive use of rehearsal strategies, summarising, paraphrasing, and note taking. These strategies took place both individually and in cooperation with peers. Most students made summaries or used peers' summaries. Very few students used reasoning or strategies for thinking.

Deliberate use of SLR strategies by students was indicated when they forethought certain SLR strategies and their awareness of their learning. A distinction could therefore be made in whether or not students had control their SLR strategies. This distinction can be derived qualitatively by analysing the deliberateness of the students' SRL actions, which are described in the following section. Our estimates are captured in the column *Control of SRL* in **Table 1**.

#### *Students who do not control SRL*

This group selected cognitive strategies based on familiarity and not on appropriateness for the task. Most students said that they did not adapt their learning strategy from that what they had been taught in secondary education. Their perceived reason for not adapting learning is simple: these learning strategies paid off in the past and they mostly work today, so why change them?

*Frederique: ... because you get away with it every time. You write a report in a day, you just get a pass. Why would you really do it differently next time?*

Moreover, not all students were capable of developing or adapting their learning strategy. Many students struggled with the amount of material which had to be studied.

*Anna: I really notice that since I started university, my studying has deteriorated a bit. Because I actually had quite a discipline with learning. And, I always try to read the texts and summarize them, but often it is so much that I actually cannot, not quite finish it, learn it.*

This group of non-controlling students chose peers for learning based on vicinity and amity instead of specific educational qualities. Their peer group was mostly invariable and shared their main characteristics which can be summed up as “serious, but not too serious”.

*Sander: I often sit beside the same students in class. That's not a conscious choice, it's just that we like to hang out together. They are more or less the same as I am, serious, but not too serious.*

#### *Students who control SRL*

Although the majority of students do not deliberately select a particular learning strategy, a minority are very capable of regulating their learning. They prepare for class in an appropriate manner and focus on what they think is important. They achieve their goals by consciously selecting strategies suitable for that purpose. Control is also something that is encountered in time and effort regulation. Some students show an awareness of their behaviour in favour of learning, although at first glance some of this behaviour may seem detrimental, for instance, a conscious decision to release pressure and go for a walk, just to take your mind of “it”. To students with a lesser self-regulated learning development this could seem like stopping with learning. However, in contrast, the action taken by this student is actually not a diversion from learning, but more to create the opportunity or room to have an “epiphany” or an “aha” experience. Students with well-developed SRL skills also show the ability to adapt their learning strategy if past experiences show that their current learning strategy does not suffice. If results are disappointing, they take actions to see what it is they are doing wrong and how they can alter their approach to learning. Rehearsal can still be used as a means to study knowledge, but in a conscious fashion and together with other strategies like using anchor concepts and schemas. Some use explaining to classmates as a way of learning, on top of the usual learning strategies like summarising. These students make a deliberate choice for note taking as a learning strategy, sometimes preceded by underlining paragraphs or sentences perceived as important while preparing for class, followed by a conscious choice for note taking during class. For a few students this is a new strategy, adopted since entering HE. Students use these notes to recollect what was covered in class while preparing for the upcoming exam. Students also use information provided by teachers as notes, for instance the slides used in the lecture. Students who are in control of their learning are more involved in gathering information like teacher cues, note taking, and making summaries during

classes. Although not perceived as studying for the exam, this helps them to gradually develop a mental notion of what is needed to pass the exam.

*Neline. Then you just build up that [knowledge about the subject] a little bit, and then you read the notes or you include the slides. It does not contain everything, but it is enough to pass the exam if you just go through it.*

In contrast to students without control, students who are aware of their learning do make conscious choices about which peer to involve at certain stages of learning. Different peers are chosen for different questions.

*Neline. Like [peer 1] and [peer 2] really want to transfer a little more factual knowledge. But [peer 3] and [peer 4] are pedagogically very strong. So I'd rather ask them for those things.*

This clarifies that students who are aware of their learning, have the ability to control SRL strategies. Therefore, control of SRL strategies is another important aspect of the relationship. We also made a dichotomic estimate to which of the two groups students belonged. Students with control in learning, recognisable by deliberate learning strategies such as choosing peers based on certain qualities, were classified with a yes for having control. Students without deliberate learning strategies, recognisable for instance by choosing peers based on amity, were classified with a no for this aspect (**Table 1**).

### 3.3. The Relationship between AA and SRL

These two aspects, students' goal approach and their control of SRL, can be used as dimensions to characterize the relationship between AA and SRL for specific students. Four types of students can be distinguished 1) students without control with a performance goal approach, 2) students without control with a mastery goal approach, 3) students with control a performance goal approach, and 4) students with control with a mastery goal approach. Students in these groups differ in the way they (deliberately) use and adapt their strategies and their use of peers.

#### *Students without control with a performance goal approach*

Most of these students have experienced that their present way of learning is sufficient for the norm, so they experience no incentive for development or change. Some show a lack of interest altogether, being late to class or not attending at all, or come to class unprepared. They just want to pass the tests and by doing so earn their degree, preferably with as little effort as possible.

*Norbert. I try to pick up on whatever I can, then I no longer have to do that during the exam. But I do not read the texts beforehand or after the lecture. But yes, as I say, I'm going to put as little effort as possible into the exam, and then this is the way.*

Hence they only have a rough notion of what is being covered and rely on mental notes and notes or summaries from a congenial peer. They often feel like much of the information given is unnecessary, because it cannot be directly applied, or even not at all. Their learning strategies are not intentional and mostly limited to rehearsal and note taking.

*Students without control with a mastery goal approach*

This group shares many deficiencies regarding controlling their learning with the previous group. They also select cognitive strategies based on familiarity and not on appropriateness for the task, and they do not adapt their learning strategy from what they had been taught in secondary education. However, this is not because they are satisfied with the outcome, passing the test, but because they are unable to do so. The main difference with the previous group is their approach to learning. They show signs of a mastery approach and compensate a lack of control with extra effort. However, a clear indication that learning could be more efficient is that they spend a lot of time studying, making summaries, in one case even 40 pages long. Exam preparation in this case is characterised by a great amount of effort with a very poor learning approach. Although the effect could be a high grade, the efficiency of this learning process is questionable.

*Tjerk. Well, basically it just starts with writing out each learning objective. And then it's just repeat, repeat, repeat ... It's not that it can't be done, it just takes a lot more effort, a lot more energy.*

*Students with control and a performance goal approach*

Students with a performance goal approach and the ability to control their learning can minimise effort while still pursuing their goals. They consider passing the exam is important. They achieve this by consciously selecting strategies suitable for that purpose. Iris for instance is very aware of her learning abilities. She is cognizant that what she learns will eventually be part of her professional life, but still pursues a “passing the test” approach. She knows from experience that subjects that received extra attention during class will be included in the exam, so she makes sure she masters those subjects. She also studies the subjects she finds easy, because she knows she will get a 100% score on those subjects, which creates a counterbalance to the subjects she finds difficult. But a real illustration of self-regulation is that she blocks critical thinking during study, because in her experience, that helps her pass the test.

*Iris. Critical thinking, yes, I really turn that off. I am only going to learn what the study guide says about this subject, because that's all they want to know. They don't want to know what I think, they just want to know what the right answer is. That's what exams are about, in an essay they want to know what you think and what you have learned, but not during this exam.*

*Students with control and a mastery goal approach*

Students with a professional development approach and who are also aware of their learning abilities deploy their deliberate strategies in a different manner. For instance, Neline is aware that she gains real understanding of a topic when discussing it with the teacher or with certain peers. She therefore chooses deliberately not to read the textbook on the topic because she knows from experience that she would ask far fewer questions, and thus refrain from learning.

*Neline. If I have read it in advance [the course literature] I will ask fewer questions anyway. In general, I learn a lot from discussions with people.*

This helps her get a clear and complete mental notion of what to learn. She accomplishes this by thinking about what she heard and learned in class, thus finding logic in the connection between topics. But to be able to get a complete picture, she is aware that she has to have all the pieces.

*Neline. It all has to fit together so you just have the puzzle more complete. I'd rather know everything than just a bit.*

How students perceived AA has a strong influence on how students approach their learning. Those with a performance goal approach undertook actions to do exactly that, but no more. They tried to estimate what had to be done, and with the objective of minimising effort. Students with a mastery goal approach are willing to put a great deal of effort into their study, which is reflected in their grades. However, AA had little relationship with how learning was regulated. In both groups, students differed in the amount of control they exerted. Students in both groups could achieve the same grade with a very different amount of control. A great amount of control and being aware of their way of learning enabled students to focus on what they wanted to achieve, which could be either just to pass the test or improve their professional development. As a corollary, students can maximise efficiency of their learning.

To summarise, we found two aspects that influence the relationship between SRL and AA: their goal approach and the deliberate use of SRL strategies. These two aspects form the basis for our model where we distinguish four different student types. These student types can help to understand the relationship between SRL and AA.

#### 4. Discussion

In the literature on academic achievement, a distinction is often made between high achievers and low achievers (Broekkamp & Van Hout-Wolters, 2007; Butler & Cartier, 2004; Fritzsche et al., 2018; Garrett et al., 2007). We too saw that distinction when we operationalised AA as grades. What we did not find is a direct relationship with SRL. Of course, we encountered students who achieved high grades and who also showed a high level of SRL. However, we also saw students who struggled to deploy the right learning strategy, but compensated this deficiency by putting in more effort and, after an arduous study, also got a high grade. This learning behaviour can also contribute to test anxiety, which we know affects a large number of students (Sperling et al., 2017). However, in our small sample we did not find a negative impact on AA (Spielberger, Anton, & Bedell, 2015). Instead, we found a significant impact on the time spent studying materials already known.

The opposite is also true. Some students with a high level of SRL used these skills to maximise learning efficiency and thus minimised effort, while still upholding what we want them to do: pass the exam. Being very aware of their learning skills and deliberately deploying the appropriate learning strategy, these students are capable of passing the exam while avoiding too much effort.

The effort that students put in their study is therefore an important factor in

achieving academic success, regardless of their level of SRL skills, albeit that students with sufficient SRL skills definitely have an advantage as they are much more able to steer their learning. It is therefore impossible to derive a student's SRL skills from grades alone.

Students can have one of two approaches to learning: passing the tests or professional development. This resonates with earlier findings of Ames, who shows that there are two goal orientation approaches: mastery and performance goals (Ames, 1992). Pintrich (2000) also refers to Ames' definitions, but diverges from the performance goal approach definition by omitting the part 'or by achieving success with little effort' which Ames specifically mentions. Students with a performance goal approach with developed SRL skills can do just that. They define success as passing the test because in their perception, the assessment system asks them to do just this, and they use their skills to minimise effort. Higher grades demand more effort than just passing the exam, while having a lack of SRL skills demands greater effort than learning with well-developed SRL skills.

In this light, and to answer the research question, we propose four types of students, based on the two distinctive aspects: goal approach and the ability to control SRL strategies. This affirms the advice that Hillier provided in a webinar (Hillier et al., 2021). He told students to work smart rather than hard, then focus your effort. In a summative assessment system, smart can be interpreted in both a performance approach and a mastery approach, with or without sufficient SRL skills (Table 2), dependent on the student.

These typologies are partly in line with previous findings. Marton and Säljö (1976) defined two approaches to learning: deep and surface. These findings correspond with our sufficient and high achievers. Biggs (1987) added a third: a strategic approach, which reminiscences our findings in the conscious sufficient achiever. Heikkilä et al. (2012) also proposed student groups. They identified two groups: "reproducing students" with insufficient regulatory skills, and "meaning oriented and optimistic" students. Key in this definition is the presence of regulatory skills as recognised in our study. The difference is that when students are compared with the outcome of the most common way to define AA, grades, we see students deploying a surface approach with regulatory skills and vice versa. Heikkilä concluded that grade point average (the definition they used as AA) had low positive correlations with the deep approach to studying and SRL. Our model can explain these findings by showing that students with regulatory skills can use these skills to obtain high grades, but also to minimise effort in which case grade point average would remain low. Other studies also suggest that performance-approach goals are unrelated to positive indicators of self-regulation (e.g., Kaplan & Midgley, 1997), and some suggest that they are related to some undesired cognitive, emotional, and behavioural processes that provide negative indicators of self-regulation (Lichtinger & Kaplan, 2011). Despite the prevalence of student types in the literature, we hitherto did not encounter the four types that we postulate.

**Table 2.** Student typology based on control of SRL and Goal approach.

		Goal Approach	
		Performance (little effort - not hard)	Mastery (effort - hard)
<b>Control of SRL</b>	Present (smart learning)	Conscious Sufficient	Conscious High
	Lacking (haphazard learning)	Blind Sufficient	Blind High

One of the limitations of this study is that we compare the outcome of an exam with students' SRL abilities which would ideally be used for a deep learning approach. Numerous studies have shown the relationship between the possession of regulatory skills and deep learning. However, exams with outcomes expressed as grades, are still common practise in many universities. Perhaps the conscious sufficient student type is merely a consequence of the summative assessment system as demonstrated by Cilliers et al. (2010). These findings also echo Phan's postulation that a high sense of perceived competence helps individuals orientate towards success and positive achievable outcomes (2010, p. 314), with the addition that for some students, success and positive achievable outcomes are simply interpreted as "passing the test".

## 5. Conclusion

The significance of this model could be of great importance, as it explains why some studies show no improvement in achievement when, at the same time, rising metacognitive skills are found. Further, it shows that investments in SRL skills are paramount, but investments have to be aimed at students with a deficiency in SRL skills, and not towards students with low grades per se. Further development and validation of the typology is required to fully exploit its potential as a means of engaging the right students, for example with metacognitive training.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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