

# Motivation and Performance of First-year Students

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## Abstract

Adjusting to academic life and managing to perform well at university is challenging for any first-year student. One of the keys to study success is motivation. In line with the social cognitive approach, two motivational constructs are considered: self-efficacy and attribution. Previous studies predominantly took a 'snapshot' of first year students' motivation, thereby ignoring the fact that students re-evaluate their self-efficacy as they experience success and failure over time. It is believed that a better understanding of such changes might inform targeted interventions. This case study investigated the development of self-efficacy beliefs and attribution among first-year students in an Economics undergraduate program. One hundred and four students completed three questionnaires at the start of their first academic year, two months later and after they received the results of their first semester exams. Repeated multivariate tests were conducted in order to analyse significant differences in self-efficacy and attribution scores over time. The results suggest that unsuccessful students hold unrealistic self-efficacy beliefs about courses that are new to them. Furthermore, attributions were dependent on the course involved and on students' exam results. As a consequence, it is suggested to organize early detection and to provide feedback in order to render these beliefs more truthful.

**Key words:** freshmen, self-efficacy, motivation, attribution, self-regulated learning

## 1. Introduction

The freshman year at university is a key period in the academic life of students, filled with new challenges (Gibney et al. 2011). Many first-year university students fail and there is a high dropout rate (Declercq and Verboven 2014). It seems that a great deal of these failures and successes can be explained by two processes: motivation and self-regulation "In a sense, motivational processes set the stage for goal attainment but self-regulation takes over to help one reach goals" (Schunk and DiBenedetto 2020 p.5). To describe and analyse the interplay between the two processes an integrative theoretical model is needed. The social cognitive perspective on self-regulated learning (Panadero 2017; Zimmerman 2011) provides such a model and is used in this study. After all, as Koenka (2020) concluded, the major theories adopt a social-cognitive approach to understanding motivation. This approach, developed by Bandura, introduces several motivational constructs. Pintrich (2003) discerns five families of motivational beliefs: self-efficacy, attribution, intrinsic motivation, goal orientation and task value. This study concentrates on the construct that is the most researched, self-efficacy, and on a construct that is related to self-efficacy: attribution (Bandura 1997; Schunk and DiBenedetto 2020). Next, we take a look at the relations between motivation and self-regulated learning in the integrative model. The model adopts a cyclical view (Zimmerman 2011). Learning is divided into three cyclical phases: forethought, performance and self-reflection. An increasing body of research highlights the link between these three phases and motivation (Schunk and DiBenedetto 2020). In this regard, an important strand in scientific literature points at the role of students' motivation as a precursor for their performance (Ning and Downing 2010). The most researched motivational construct, self-efficacy, is situated in the forethought phase but performance can - because of the cyclical nature of the model - also influence self-efficacy. Attribution is situated in the self-reflection phase when learners evaluate their performance. This evaluation can lead to altering the approach to learning and thus influences the forethought phase. Zimmerman (2015 p.543) described it as follows: "causal attributions are not only expected to affect students' persistence and emotional reactions but also adaptation in their methods of learning". These adaptations performed in the performance phase can - amongst other things - deal with task strategies, help-seeking or time management (Zimmerman 2011).

Students often lack the necessary self-regulation skills required for achieving learning and performance goals (Duchatelet and Donche 2019). New students have to adjust to new expectations, may feel academically unprepared (D'Lima et al. 2014) and report personal problems related to self-management (Trautwein and Bosse 2017). Universities and educators trying to support students during their first year at university benefit from dedicated research about critical factors impacting academic performance (Gibney et al., 2011). A better understanding of these changes can be used by educators to decide the implementation of interventions (Johnson et al. 2014).

Both motivational constructs, their role as influencers and effects of performance, their measurement, as well as their interrelation are described in the next paragraphs.

## **2. Theoretical Background**

### *2.1 The Role of Self-efficacy*

Social cognitivists stress the reciprocal relations between students' self-efficacy and their performance. Self-efficacy, or the judgment by students of their individual capabilities, affect their effort and persistence. Inversely, a successful performance may enhance self-efficacy (Schunk et al. 2014). Different studies in the area of business and economics education pointed out that self-efficacy is undeniably important to explain how (first year) students deal with challenging circumstances and why variations in academic performance may occur. Beatson et al. (2020) found, for example, that first year students' self-efficacy for Accountancy had a stronger relationship to their final first year grade than to their high school experience with Accountancy. Self-efficacy is also found to be the primary source of motivation for self-regulation (Alexander et al. 2011). In contrast, students with a low self-efficacy lack the confidence to seek help, to judge the standard required to do well in examinations or to carry out learning activities effectively (Byrne et al. 2014).

In general, research shows that self-reports are the best way to uncover students' perceptions and are measurement tools that "offer unique explanatory power when it comes to understanding motivation and strategy use" (Van Meter 2020 p. 177). Winne (2020) agrees that there are no good alternative instruments to capture thinking. However, Van Meter (2020) adds that self-reports "may be better at explaining a learner's past than predicting that learner's future" (p. 182).

An accurate assessment of self-efficacy accounts is characterized by a correct specificity and adequate timing of measurement. The first mentioned, specificity, refers to the fact that the measurement is tailored to a specific domain of functioning, or specific to a situation (Bandura 2006). Nevertheless, as Bandura (1997) explains, "there are at least five processes through which mastery experiences can produce some generality in personal efficacy" (p. 51). One of these processes is related to self-regulatory skills. These are generic skills that are used in several activity domains. A second process concerns co-development, when competencies are acquired together, for instance at a university. The consequence of these outcomes is that there is a co-variation in perceived efficacy among different domains (Bandura 2006). Alexander et al. (2011) suggest therefore that self-efficacy has a domain-specific and a domain-general component. The domain general aspect is present in the self-efficacy for self-regulated learning, used for instance by Zimmerman et al. (1992). Some constructs are used in varying degrees of specificity. Honicke and Broadbent (2016) state in their review that, in an academic context, self-efficacy frequently is described in terms of academic self-efficacy (measured across varying degrees of specificity) and defined as a "learner's judgment about their ability to successfully attain educational goals" (p.64). The meta-analytical findings suggest a moderate positive relationship between academic self-efficacy and performance and indicate that self-regulating skills (effort regulation) mediate this relation. It is important to note that several studies report that the specificity level of the measurement impacts on the strength of this relation, with specific self-efficacy resulting in more significant correlation than general self-efficacy (Honicke and Broadbent 2016, p. 76).

The second crucial element when measuring self-efficacy, besides the specificity, is the timing of measurement. The role of two aspects in this timing - the reciprocal relation with performance and familiarity with performance - is briefly discussed. It follows from the reciprocal nature of the relationship between self-efficacy and performance that longitudinal studies shed light not only on the influence self-efficacy has on performance but also on the much less researched influence of performance on self-efficacy (Honicke and Broadbent 2016). Concerning familiarity with performance, it is of great importance to take into account that "judgment of self-efficacy requires knowledge of task demands" (Bandura 1997 p. 64). In new contexts, individuals have limited knowledge on the basis of which to assess the adequacy of their self-efficacy beliefs. Assessment is especially difficult when the new patterns of behaviour are very complex (Bandura, 1997).

Honicke and Broadbent (2016) report that the point in time at which academic self-efficacy is measured influences the strength of the correlation with performance. This correlation was stronger from the mid-point of a course. In the context of first-year students, it can be presumed that students are familiar with regulation of learning and that self-efficacy for self-regulated learning will be more accurate in predicting performance than academic self-efficacy. Furthermore, Huang's meta-analysis (2013) reported gender differences in academic self-efficacy, but these are different depending on the content domain. Women, for instance, showed higher language and arts self-efficacy but lower mathematics self-efficacy.

In sum, we propose comparing different measurements of self-efficacy in relation to performance. On a domain-general level it seems important to focus on academic self-efficacy and on self-efficacy for self-regulated learning. On a domain specific or course level it would be interesting to follow the development of self-efficacy for courses dealing with subject matter totally new to first-year students.

## 2.2 The Role of Attribution As a Precursor of Student Performance

Attributions are the perceived causes of outcomes, which have psychological and behavioural consequences (Schunk et al. 2014). Early researchers often used the four attributions of Weiner (e.g. 2010): *ability*, *task difficulty*, *effort* and *luck*. Later researchers used more inclusive lists (Schunk et al., 2014). Perry et al. (2008) included for instance *teacher quality* and *strategy*. McClure et al. (2011) added *teachers*, *family* and *friends*, Hsieh and Kang 2010) also used *teacher* and *mood*. Hawi (2010) found ten causal attributions for instance *cheating*, *lack of practice* and *anxiety*.

There's more consensus on the use of three dimensions for the classification of attributions, but there's some disagreement about the nature of these dimensions (Schunk et al. 2014). Ultimately it is the perceiver's classification of the attribution that affects the consequences. The three dimensions introduced by Weiner (2010) are locus, stability and controllability.

"The locus dimension concerns whether a cause is perceived as being internal or external to the individual (Schunk et al. 2014, p. 98)". Attributions like ability, skill and effort are seen as internal, luck and teachers are seen as external. The consequences of internal or external attributions are different depending on the event. An external attribution in the case of failure can help to maintain self-esteem but it can result in lower self-esteem in the case of success.

The stability dimension refers to a cause that is fixed or variable. Ability and task difficulty are considered stable, but there's some discussion about the perception of effort. If a lazy person makes an effort in a specific situation, effort can be considered unstable (Weiner 2010). Effort in a specific situation can thus be seen as unstable and long-term effort (across situations and over time) can be seen as stable (Schunk et al. 2014). Stable causes for failure can lead to helplessness and stable causes for success but unstable causes for failure (e.g. *bad luck*) can generate hope.

The controllability dimension is about the perception of control a person has over a cause. *Effort* is the most important controllable attribution. *Bad luck* is uncontrollable. An uncontrollable attribution will in the case of failure probably lead to shame (and sometimes to dropping out); a controllable attribution will in the same event probably lead to guilt (Schunk et al. 2014).

Gordeeva' et al. (2020) concluded that an optimistic attributional style for positive events "which views positive outcomes as being due to stable, global, and internal factors" (p. 34) was the most reliable predictor of academic achievement. Local and unstable attributions might help students to cope with failures (Gordeeva et al. 2020).

Several questions come to the fore when researching attributions e.g. What attributions should be taken into account? What are the perceived causes of what outcomes? How should they be measured and who are the participants (subgroup of learners)?

Studies differ concerning the number of attributions. Dong and colleagues (2013), for example, report that many studies examined only a single causal attribution but argue that it is more realistic to examine multiple causal attributions. Many studies concentrate on attributions of failures while attributional style for positive events can be a more reliable predictor of achievement (Gordeeva et al. 2020). Dong et al. (2013) suggested that inconsistencies in results could be related to the course contents and that future research could help to support this assertion.

A further relevant consideration is the nature of the subgroup of learners and which interpersonal variables are considered relevant. The meta-analysis of Gordeeva et al. (2020) reveals that most studies use university students. Some studies concentrate on first year students. The impact of the situation on attributional thinking is very clear in the new achievement setting of first year students (Perry et al. 2008). Some students are over-optimistic about

their grades and unrealistically high expectations based on uncontrollable attributions (e.g. “this course is easy”) can undermine motivation and performance (Haynes et al. 2009). The first exams in higher education generate important feedback to students and the attributions of success or failure will have significant consequences on students’ beliefs and behaviour (Schunk et al. 2007). This is why attributional retraining is typically administered to first-year university students because unpredictable failure events erode motivation (Haynes, et al. 2009). Perceived control and motivation appear to be good predictors of college outcomes (Haynes, et al. 2009). Soriano-Ferrer and Alonso-Blanco (2020) found differences based on the second language level of the students. Beginners perceived their success to be dependent on some internal but unstable controllable variables and external variables such as the *teacher influence* and *task difficulty*. Higher level students perceived success as dependent on internal variables like *ability* and *preparation*. Furthermore, gender is another individual characteristic that can influence the choice of the attributions. The use of the dimensions is, according to some studies (McClure et al. 2011), different for male and female individuals (male students attributing, for instance, success more to *ability* than female students). Other studies, however, have not found gender differences (Schunk et al. 2014).

In most studies participants are asked to react to an imagined outcome to measure attribution. Gordeeva et al. (2020), for example, instructed participants to imagine that a situation happened to them and to report the most likely cause. The meta-analysis conducted by Gordeeva et al. (2020) also revealed that most studies used the general ASQ. That is an unfortunate choice, as this questionnaire also considers interpersonal situations alongside achievement situations. The effects on academic achievement reported by studies including interpersonal situations are relatively weaker than those which concern only achievement situations (Gordeeva et al. 2020). Furthermore, all these measures relate to hypothetical life scenarios.

Some studies provide more freedom of choice. McClure et al. (2011) asked students to think about their best and worst marks on assessments and to rate each of seven influences on these marks. A disadvantage with this method is that students choose assessments in a lot of different subjects. Dong et al. (2013) confines research to one subject when participants were asked to provide causes for success and failure in learning a foreign language.

Based on the literature we can conclude that it is relevant to ask first-year students for their attributions of *domain-specific* failures and successes in *real* (external valid) situations.

### 2.3 Relation between Self-efficacy and Attributions

Based on the social-cognitive theory, self-efficacy and attributions have a reciprocal relation. In other words, attributions affect self-efficacy and efficacy beliefs bias attributions (Bandura 1997). Therefore, it is important to take the amount of self-efficacy that can influence the choice of attributions into account. Self-efficacious individuals will make more use of controllable attributions in the event of success (Bandura 1997). Byrne et al. (2014) also suggests that students with low self-efficacy attribute failures to low ability.

The mental database of attributions can in turn affect self-efficacy (Tepper and Yourstone 2018). Perry and Hamm (2017) confirm that there is only some preliminary evidence about the link between attributions and self-efficacy. This evidence shows that low ability attribution of failure relates positively to incompetence appraisals and low effort attribution of failure relates negatively to incompetence appraisals. Attributing negative experiences to fixed conceptualizations of personal skill levels has a negative impact on self-efficacy (Tepper and Yourstone 2018). Gordeeva et al. (2020) suggested on the basis of a meta-analysis and two new studies that attributing successes to global and stable factors could help students to enhance their self-efficacy.

As Hsieh and Kang (2010) indicated, self-efficacy and attributions have rarely been investigated simultaneously in (quasi-)experimental studies. Even fewer studies report on a longitudinal investigation in different subject areas in real-life settings. Nevertheless, a better understanding of the development of students’ self-efficacy and their attributions would help both practitioners and researchers to discern time and ways in which to influence motivational constructs. It was previously shown that instruction may influence self-efficacy (Schunk and DiBenedetto 2021) and may involve attributional retraining (Dryden et al. 2021). Schunk and DiBenedetto (2021) pointed out that the effect of attributional feedback may depend on its credibility: highly skilled learners are, for example, less susceptible to effort attributions. Haynes et al. (2009) found that students with low perceived control benefit less from instruction. Moreover, improving students’ metacognitive reflection may aid students to understand why they score better or worse than others and could promote students’ well-being and autonomy (Soriano-Ferrer and Alonso-Blanco 2020).

Given the above considerations the aim of this study is to improve the understanding of the role played by the motivational concepts: self-efficacy and attribution. A longitudinal study suits the process aspect of these two

concepts. Domain-specific and domain-general self-efficacy measures seem to be important. A better understanding might be used by educators in order to implement targeted interventions (Johnson et al. 2014).

### 3. Research Questions

Based on the literature, the following main research questions are investigated:

RQ1. How does self-efficacy of first-year students evolve during the first semester in higher education and how does it influence exam results for different courses? Are the results different according to gender?

RQ2. Which factors do students attribute their exam results to? Is there a dissimilar attribution pattern for the different courses and for students who passed and students who did not pass?

RQ3. Are self-efficacy measures (domain specific, academic self-efficacy and self-efficacy for self-regulated learning), attributions and exam results interrelated?

### 4. Method

#### 4.1 Participants

The study employed a quantitative approach using performance data of the students from the faculty and survey data from the students. The sample consisted of 104 first-year students enrolled in a program at a Business and Economics faculty of a large Belgian university. 51.9% (54 students) were male. All participants were between 20 and 23 years old ( $M=21.26$  years,  $SD=.52$ ). Overall, more than 50% of the students passed the different courses after the first exam period (Accountancy 51.9% passed the course the first time, Micro-economics 62.5%, French 66.3%, English 63.5% and Psychology 50.0%). No significant differences between the passing rates and gender were found ( $p > .05$ ).

#### 4.2 Data Collection and Measures

Data were collected using paper-and-pencil Dutch-spoken questionnaires, which were distributed prior to the start of on-campus lectures. The questionnaires were administered at three different times during the first semester: (1) at the start of the academic year (September), (2) two months later (November), and (3) after students had been notified about their exam results (beginning of February). The three questionnaires assessed (domain specific and domain-general) self-efficacy and the third questionnaire encompassed the attributions questions: The domain specific self-efficacy was assessed for five courses: Accountancy, Micro-economics, Psychology, English and French (one question for each course on a 10 point scale).

Two previously validated (domain-general) self-efficacy measures were translated into Dutch: (1) academic self-efficacy (SE-ACA) and (2) self-efficacy for self-regulated learning (SE-SRL). The first mentioned is actually the subscale 'self-efficacy for learning and performance' of the Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich et al. (1991). Honicke and Broadbent (2016, p 67) reported in their review that the MSLQ is "the most commonly reported measure" of academic self-efficacy". From the list of items one was deleted because it did not fit the situation. The remaining items covered students' expectancy of success and their domain-general self-efficacy. As suggested by Bandura in his "Guide for constructing self-efficacy scales" (2006) a Likert scale response format was selected, with '0' meaning *I totally disagree* and 10 corresponding to *I totally agree*. An index was calculated for SE-ACA by averaging all 7 items. The SE-ACA has a consistently high internal reliability with Cronbach's alpha values (time period 1  $\alpha_1$  .902; t2  $\alpha_2$  .928 and t3  $\alpha_3$  .921).

A similar procedure was followed to develop and assess the SE-SRL scale. One item was removed from the original instrument of Zimmerman et al. (1992). The responses on the 10-points Likert scale were averaged to form an index for SE-SRL. This 10-items scale has a consistently high internal reliability with Cronbach's alpha values of .890 for time 1,  $\alpha_2$  .905 for time 2 and for time 3  $\alpha_3$  .908.

The third questionnaire assessed the extent to which students' attributions were related to their scores on the exams (5 courses), as well as the extent to which they considered their results better or worse than expected. The four attributions of Weiner (2010) were selected, namely: *ability*, *luck*, *task difficulty* and *effort*. Next a distinction was made between *effort during the academic year* and *effort during the exam period*. The list was expanded with *teacher*, *interest* (Dong et al. 2013) and *stress* (Barros and Simao 2018). Students were asked to indicate on a five-point scale how much the attributions contributed to their success in the exams (1 *totally unimportant* to 5 *very important*).

#### 4.3 Data Analysis

The data preparation and statistical analyses were performed using SPSS software version 27. A repeated

measures analysis of variance was applied to the first research question, which is required for analysing data that were collected on more than two occasions, with the same measure being rated by independent groups of participants. The analyses were conducted for each of the five courses with pass or fail as a between-subjects factor and self-efficacy as a within-subjects factor. For RQ2 independent t-tests and for RQ3 binary logit regression analyses were applied.

## 5. Results

Research question 1: How does the self-efficacy of first-year students evolve during the first semester in higher education and is it related to the exam results for the different subjects?

The scores of successful students (pass) and unsuccessful students (no pass) were evaluated for two domain-general and five domain-specific measures of self-efficacy at three time points (see 4.2.).

First the two domain-general measures are evaluated: self-efficacy for self-regulated learning (SE-SRL see Figure 1) and academic self-efficacy (SE-ACA see Figure 2).

The SE-SRL scores at the beginning of the academic year were not significantly different between the successful ( $M = 7.60$ ,  $SD = .96$ ) and unsuccessful ( $M = 7.28$ ,  $SD = .99$ ) students ( $t [92] = 1.578$ ;  $p = .059$ ), and decreased significantly for all students across the three time points ( $M_1 = 7.37$ ,  $SD = 1.00$ ,  $M_2 = 6.98$ ,  $SD = 1.04$ ,  $M_3 = 6.91$ ,  $SD = 1.21$ ;  $F[2, 103] = 23.182$ ,  $p < .001$ ). No gender effect was observed ( $F[1, 102] = .481$ ,  $p = .490$ ). However, the successful students scored significantly higher on SRL in the three periods compared to the unsuccessful students ( $F[2, 184] = 5.873$ ,  $p = .003$ ).

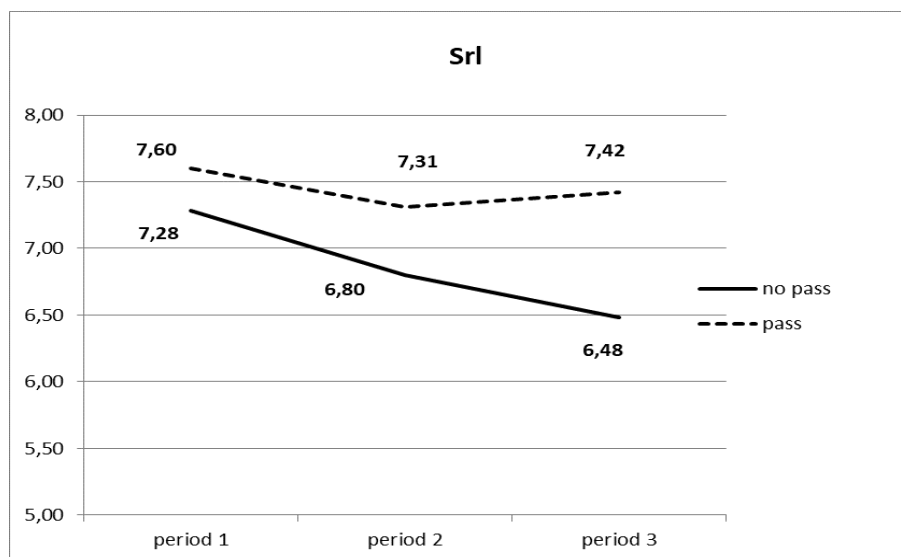


Figure 1. Average scores of self-efficacy for Self-Regulated Learning (SRL)

Also, the SE-ACA scores (see Figure 2) did not differ significantly between period1 and period2 between students who passed ( $M = 6.42$ ,  $SD = 1.00$ ) and those who failed ( $M = 6.43$ ,  $SD = .98$ ). However, after the exams (period 3 't3'), unsuccessful students scored significantly lower on SE-ACA ( $M = 5.93$ ,  $SD = .90$ ) than students that passed ( $M = 6.93$ ,  $SD = .97$ ). Gender did not significantly influence these results ( $F[1, 90] = .062$ ,  $p = .804$ ).

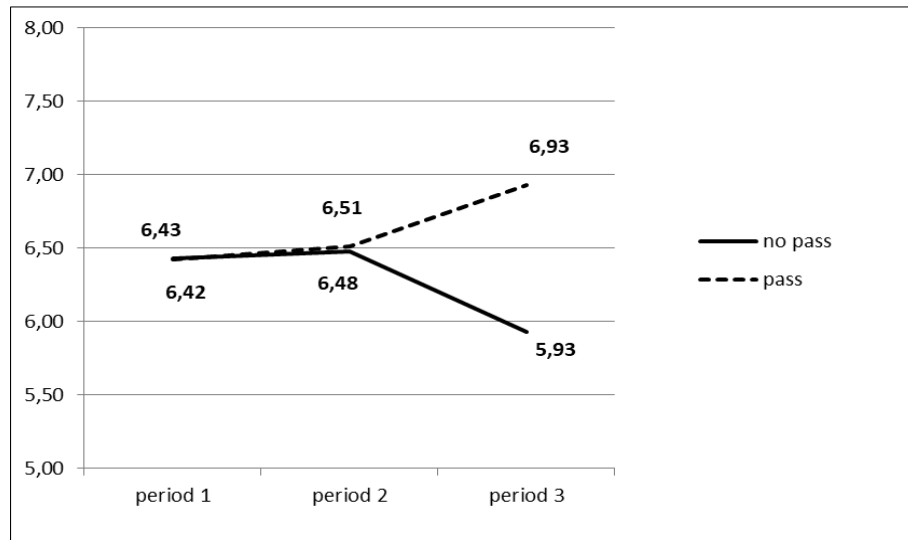


Figure 2. Average scores of academic self-efficacy (Se-ACA)

The domain-specific measures are presented in Figures 3 to 7.

Self-efficacy for Accountancy (see Figure 3) also differ significantly for period 3 ( $F [2,194] = 74.572; p < .001$ ).

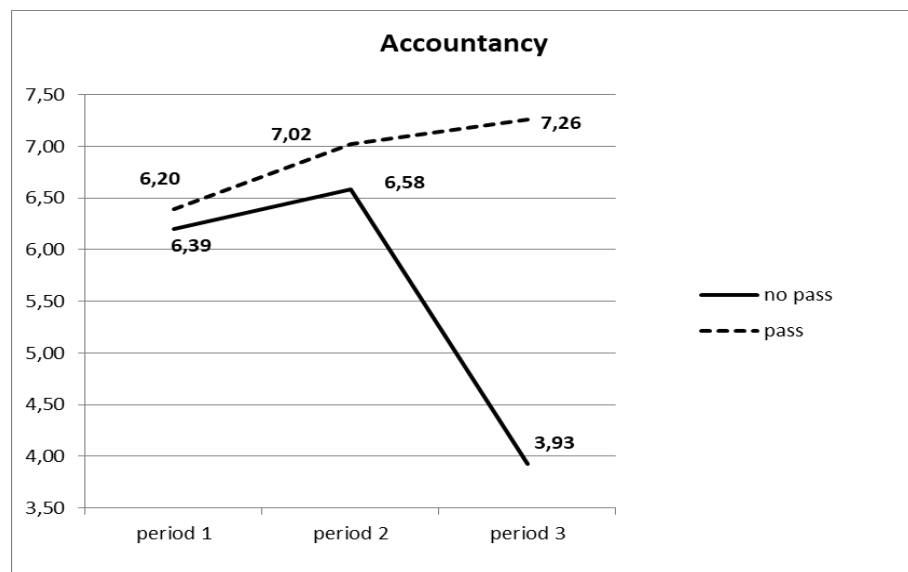


Figure 3. Average scores of self-efficacy for Accountancy

Furthermore, the results show no significant differences for gender ( $F [1,95] = .109; p = .742$ )

The same pattern was found for Micro-economics (see Figure 4). The results of the repeated ANOVA indicate a significant difference for the third period ( $F [2,194] = 41.283; p < .001$ ) and no significant differences were found for gender ( $F [1,97] = .057; p = .812$ ) for the three periods.

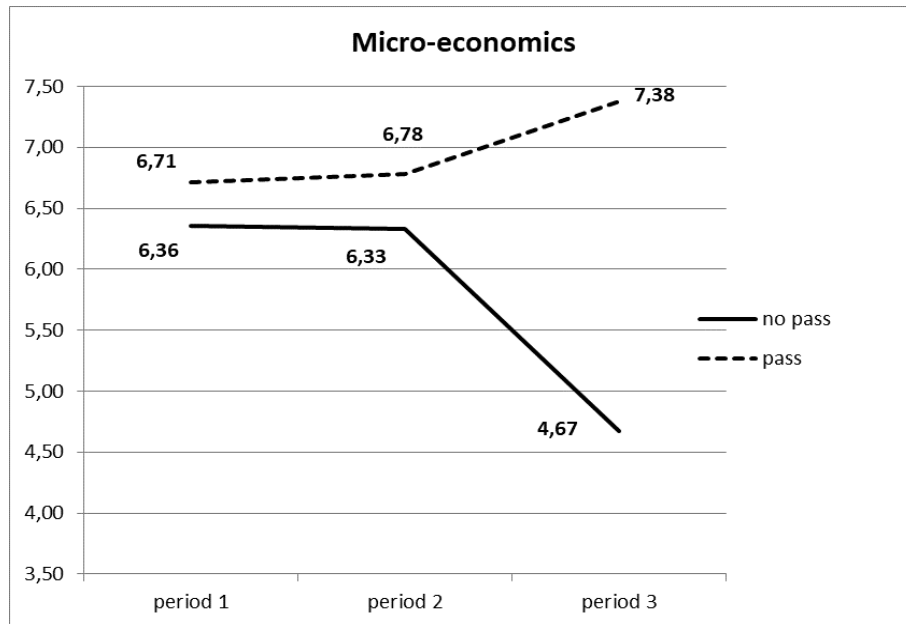


Figure 4. Average scores of self-efficacy for Micro-economics

In Figure 5 the results of self-efficacy are presented for Psychology. Again Repeated ANOVA ( $F [2,182] = 23.936$ ;  $p < .001$ ) indicate a significant difference between the students who passes the course ( $M_3 = 6.59$ ) compared with the students who did not pass the course ( $M_3 = 4.22$ ).

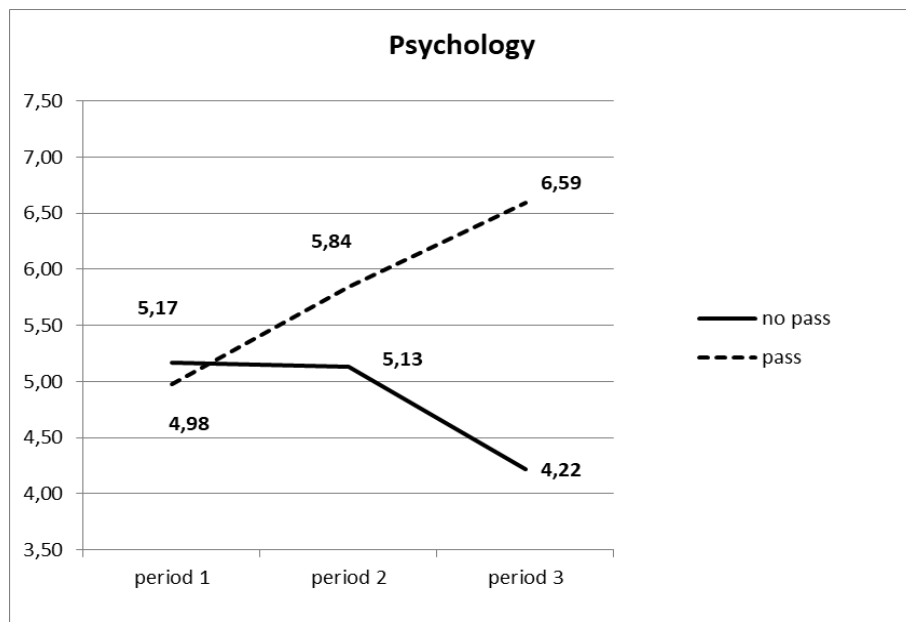


Figure 5. Average scores concerning self-efficacy for Psychology

The test for between subjects for gender shows a small significant difference for gender ( $F [1,91] = 4.062$ ;  $p = .047$ ) whereby male respondents score significant lower than female.

Finally for the language courses (English and French) we observe different patterns. However, the average score on self-efficacy is significant lower in period 3 for the students who did not pass the course ( $F [2,186] = 19.643$ ;  $p < .001$ , see Figure 6) and gender did not significantly influence the pattern ( $F [1,93] = .004$ ;  $p = .948$ ).



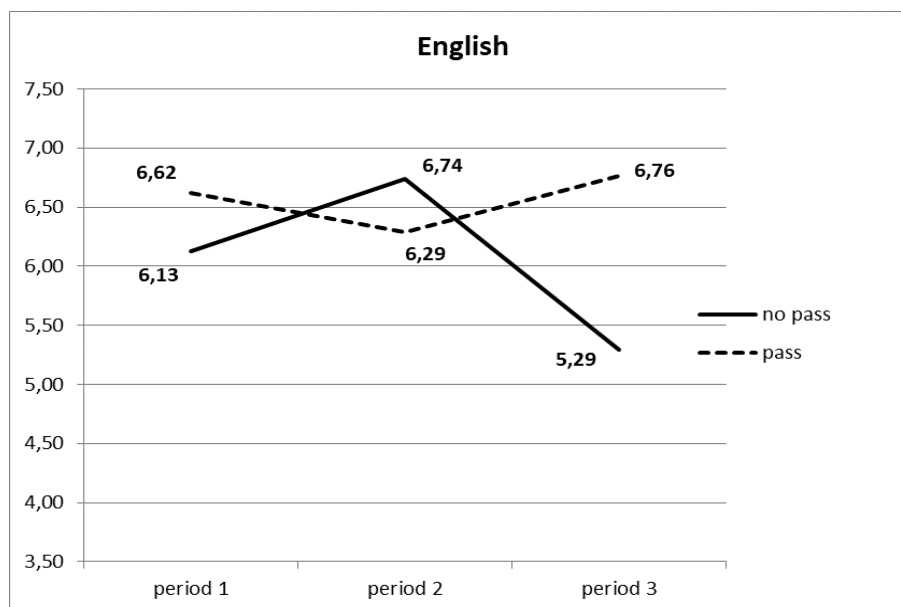


Figure 6. Average scores of self-efficacy for English

For the French course, we found significant differences for all the three time periods between students who passed and not-passed the course (see Figure 7,  $F [2, 186] = 15.721$ ;  $p < .001$ ). Male students score significantly lower than the female students ( $F [1, 93] = 5.073$ ;  $p = .027$ ).

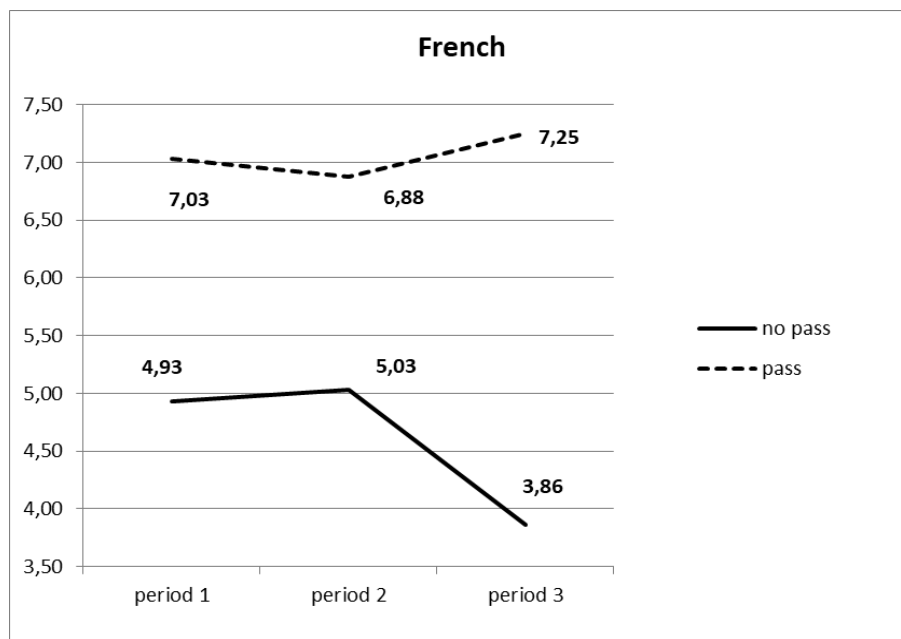


Figure 7. Average scores of self-efficacy for French

Research question 2: To which factors do students attribute their exam results? Is there a similar attribution pattern for different courses and/or for students who passed versus those who did not?

Attribution analyses were conducted in two groups (pass or fail) and this was done for each of the five courses. Different attribution patterns emerged depending on the course involved and depending on the results of the students. Successful students made more internal attributions than unsuccessful students (see Table 1). The highest average scores were awarded to *effort during the exam period* and *ability*.

Table 1. Average attribution scores for students who passed and failed the course

Attributes	Pass	Accountancy			Micro-economics			Psychology			English			French		
		average	SD	t-value (p-value)	average	SD	t-value (p-value)	average	SD	t-value (p-value)	average	SD	t-value (p-value)	average	SD	t-value (p-value)
Stress	no	3,00	1,35	1,146	<u>3,14</u>	1,40	2,783	2,63	1,35	0,464	<u>3,000</u>	1,461	2,364	3,107	1,257	1,657
	yes	2,72	1,04	(0,255)	<u>2,42</u>	1,14	(0,006)	2,51	1,12	(0,640)	<u>2,338</u>	1,189	(0,020)	2,618	1,339	(0,101)
Interest	no	<u>3,31</u>	0,97	2,821	<u>3,39</u>	1,13	3,027	2,96	1,20	3,019	2,968	1,197	1,360	2,893	0,994	1,184
	yes	<u>3,83</u>	0,85	(0,006)	<u>4,00</u>	0,86	(0,003)	<u>3,63</u>	1,00	(<0,001)	3,277	0,960	(0,177)	3,203	1,232	(0,240)
Effort during exam period	no	<u>4,00</u>	1,07	4,098	<u>4,06</u>	0,95	2,776	<u>3,98</u>	1,14	2,193	4,032	1,110	1,065	4,000	1,155	0,112
	yes	<u>4,72</u>	0,53	(<0,001)	<u>4,48</u>	0,59	(0,007)	<u>4,41</u>	0,80	(0,030)	4,262	0,923	(0,290)	3,971	1,150	(0,911)
Effort during the ac. year	no	3,69	1,08	0,198	3,53	1,18	0,457	3,35	1,38	1,396	3,323	1,351	1,054	3,429	1,372	1,462
	yes	3,74	1,24	(0,844)	3,64	1,19	(0,649)	2,98	1,29	(0,170)	3,015	1,329	(0,295)	2,986	1,345	(0,147)
Ability	no	<u>4,07</u>	0,91	2,737	<u>4,03</u>	1,00	2,778	<u>3,73</u>	1,11	3,054	<u>3,452</u>	1,362	1,796	3,643	1,224	1,442
	yes	<u>4,49</u>	0,61	(0,007)	<u>4,47</u>	0,59	(0,007)	<u>4,29</u>	0,70	(<0,001)	<u>3,877</u>	0,927	(0,076)	4,000	1,051	(0,153)
Task difficulty	no	3,80	0,79	1,437	3,75	0,84	1,165	3,67	0,95	0,894	3,548	1,121	0,299	<u>3,643</u>	1,193	2,259
	yes	3,57	0,77	(0,154)	3,54	0,88	(0,247)	3,49	1,01	(0,370)	3,615	0,979	(0,766)	<u>3,101</u>	1,017	(0,026)
Luck	no	<u>2,31</u>	1,10	2,019	<u>2,44</u>	1,16	1,803	<u>2,90</u>	1,32	2,216	2,774	1,309	1,540	2,643	1,339	1,447
	yes	<u>1,91</u>	0,88	(0,046)	<u>2,05</u>	1,00	(0,074)	<u>2,31</u>	1,29	(0,030)	2,338	1,290	(0,127)	2,232	1,238	(0,151)
Quality of instruction	no	3,61	1,04	1,057	3,81	0,92	0,206	3,52	1,01	0,932	3,355	1,380	1,008	3,571	1,136	1,374
	yes	3,83	0,98	(0,293)	3,77	0,94	(0,837)	3,71	0,97	(0,350)	3,600	0,965	(0,316)	3,206	1,204	(0,173)

Research question 3: Are self-efficacy measures (domain specific, academic self-efficacy and self-efficacy for self-regulated learning), attributions and exam results interrelated?

To answer the third research question a model that could predict discrete outcomes (pass/fail) was needed. Therefore, a binary logistic regression model was the best option since there were only two possible discrete outcomes: passing versus failing the course in the exam period. The following independent variables were selected to estimate to what extent they significantly influence the pass rate of the course: eight different attributions (measured after the first exam period,  $t_3$ ), academic self-efficacy (SE-ACA) measured in  $t_2$ , self-efficacy for self-regulated learning (SE-SRL) measured in  $t_2$  and the domain specific self-efficacy of the course (measured in  $t_2$ ). In Table 2 the estimated coefficients, standard errors, log-odds (exp (B)), and fit values of the models are presented.

Table 2. Effects of explanatory variables on passing the course

<i>Attributions</i>	Accountancy		Micro-economics		Psychology		English		French	
	Estimated Coefficients (p-value)	Log odds ( <i>Exp (B)</i> )	Estimated Coefficients (p-value)	Log odds ( <i>Exp (B)</i> )	Estimated Coefficients (p-value)	Log odds ( <i>Exp (B)</i> )	Estimated Coefficients (p-value)	Log odds ( <i>Exp (B)</i> )	Estimated Coefficients (p-value)	Log odds ( <i>Exp (B)</i> )
Stress	-.454 (.078)	.635	-.714** (.004)	.490	-.175 (.430)	.839	-.903** ( $<.001$ )	.405	.212 (.507)	1.237
Interest	1.032* (.011)	2.806	.752* (.033)	2.122	.602* (.038)	1.825	.442 (.210)	1.555	.309 (.398)	1.362
Effort during exam period	1.839** ( $<.001$ )	6.292	.839 (.071)	2.313	.259 (.477)	1.296	.212 (.534)	1.237	.616 (.164)	1.851
Effort during the ac. year	-1.01** (.003)	.364	-.251 (.386)	.778	-.557* (.014)	.573	-.451 (.081)	.637	-.405 (.245)	.667
Ability	.406 (.387)	1.502	.420 (.352)	1.521	.684 (.065)	1.982	.586 (.072)	1.796	-.270 (.502)	.763
Task difficulty	-.817* (.039)	.442	-.559 (.171)	.572	.251 (.405)	1.285	-.236 (.520)	.790	-.712* (.035)	.491
Luck	-.236 (.389)	.790	.190** (.005)	1.019	-.333 (.112)	.717	-.145 (.530)	.865	-.051 (.858)	.950
Quality of instruction	-.519 (.143)	.595	-.544 (.166)	.580	-.096 (.725)	.908	.171 (.541)	1.187	-.212 (.514)	.809
SE-SRL (t2)	.933* (.014)	2.541	.967** (.008)	2.630	.177 (.565)	1.193	.918** (.007)	2.503	1.475** (.002)	4.369
SE-ACA(t2)	-.736 (.083)	.479	-.818 (.061)	.441	-.198 (.492)	.820	-.370 (.282)	.691	-1.154** (.009)	.315
SE -course (t2)	.455 (.095)	1.577	.226 (.451)	1.253	.353 (.060)	1.423	-.344 (.093)	.709	.828** (.003)	2.288
Constant	-7.786* (.035)	.001	-3.532 (.247)	.029	-5.143** (.030)	.006	-.908 (.669)	.403	-5.049 (.102)	.006
<i>Fit values:</i>										
Log likelihood (estimated model)	85.357		89.962		105.338		90.763		70.117	
R <sup>2</sup> Nagelkerke	.524		.448		.367		.375		.531	
U <sup>2</sup> (% predicted correctly)	63.3%		78.6%		72.7%		77.1%		87.1%	

Note. \*\* significant ( $p < .01$ ), \*significant ( $p < .05$ )

In binary logistic regression the log-odds (see Table 2) can be interpreted as odds ratios. For every unit increase in the answer, the probability becomes  $\exp(B)$  higher. For example, the probability that a student passes accountancy is 2.806 times higher if the student scores one point on the scale higher on interest in the course. Stress, on the other hand, significantly reduces the passing rate for Micro-economics and English. Furthermore, Table 2 shows the significant positive influence of 'interest' for Accountancy, Micro-economics and Psychology and not for the language courses, French and English. Stress has a (significant) negative influence on the pass rate and also the task difficulty, although the last attribute is only significant for Accountancy and French. Table 2 shows that SE-SRL has a significantly positive influence on the pass rate for all courses (except Psychology). Furthermore, the different goodness of fit values are satisfactory and indicate that the models are significantly better than the null models. Finally, Table 2 shows how many cases were correctly predicted using the full binomial logit model, using a cut-value of .500. The overall percentage of cases that were correctly predicted is between 63.3% (Accountancy) and 87.1% (French).

## 6. Discussion

The first research question deals with the evolution of self-efficacy during the first semester.

The general and domain-specific self-efficacy measures -with the exception of self-efficacy for French- don't reveal any differences between successful and unsuccessful students in the first and second measurement. Because most students didn't have any experience with micro-economics, accountancy and psychology, they are not able to estimate whether they can handle those subjects. English on the other hand is not a new subject, but all students seem to think they can manage it! This all changes with the third measurement where we can see a clear distinction -for all general and domain-specific measures- between students that failed and those that succeeded. In a systematic review Honicke and Broadbent (2016 p. 77) found that academic self-efficacy "...correlated with academic performance only from the mid-point of a subject onward". A recent study (Han et al. 2021) also emphasizes the positive link between academic self-efficacy and performance. The changes in domain-specific self-efficacy seem to indicate that unpredictable failures affect motivation negatively (Haynes 2009). Successful students on the other hand had powerful mastery experiences that did raise their self-efficacy (Bandura 1997). A relatively strong relationship between self-efficacy and final grade in an introductory accounting course was also found in other studies (Beatson et al.2020; Tepper and Yoursone 2018). A similar pattern can be seen with academic self-efficacy. This similar pattern is also suggested by Bandura (1997 p. 51) who describes "five processes through which mastery experiences can produce some generality in personal efficacy".

The self-efficacy scores for self-regulated learning decreased for all students and this corresponds with the results of Caprara and his colleagues (2008 p.530) who discerned "... a progressive decline as students advance through the educational system".

A mixed result is noted concerning gender effects: there's a gender effect in only two (self-efficacy for psychology and for French) of the seven measures of self-efficacy. Huang (2013) points at mixed results according to content domain, age and culture with, for instance, females displaying higher language arts self-efficacy. It is possible that this gender effect is less visible among economics students who, after all, did choose a study emphasizing numbers. No gender effect was noted for self-efficacy for accountancy in accordance with some other results (Hamann et al. 2021) and not with others (Viviers et al.2022).

Second research question: the attributions differed between successful and unsuccessful students and were different for the five courses. Successful students emphasize more the role of *effort* (internal and controllable attributions) and less *luck* and *task difficulty* (external and uncontrollable) and this seems to be a confirmation of previous findings (Barros and Simao 2018; Fong et al. 2017). Unsuccessful students have at the same time designated *ability* and *effort* leaving room for improvement within certain limits as unstable factors can help to refocus their energies (Gordeeva et al 2020). An emphasis only on *ability* implies that future failure is inevitable (Perry and Ham 2017).

Unsuccessful students made more external attributions for French and this is in agreement with the study of Soriano-Ferrer and Alonso-Blanco (2020) who found that B2 (= higher level) foreign language learners attributed their failure more to external factors such as task difficulty.

Third research question: based on our findings, the relation suggested by Bandura (1997) between self-efficacy and attribution was not confirmed, but many intriguing results about explanatory variables on passing the courses are listed in Table 2. Not all the results can be discussed in depth and they all need further investigation. It is clear though that SE-SRL plays an important role. Some other factors seem to be more domain specific. The

explanatory factors *effort during the academic year*, *effort during the exam period* and *task difficulty* concerning results for accountancy, probably reveal that this course is perceived as difficult. The combination of *stress* and *luck* could point at an underlying perceived subjectivity factor, caused for instance by the teacher or by the kind of exam. It is clear that more qualitative research is needed to understand the concrete situation in these courses that caused these attributions. The wide variety of attributions found to explain results in different courses indicates that it is important to consider multiple causal attributions for each academic performance (Dong et al. 2013). Attributions may be context specific (Perry and Ham 2017), and consist of many daily decisions that potentially encourage students toward the broader goals of persistence and degree completion (Fong et al 2017).

SE-SRL, even though important regarding several different courses, has domain specific elements while many studies assume that one SE-SRL applies to all academic contexts (Shunk and Usher 2011).

There are some limitations to consider about participants, measurements and interpretation of the results in this study.

Results are always linked to a certain group of participants and replication studies are needed.

Panadero et al. (2017 p94) also stressed that instrument design might play a role in different results: MSLQ uses more precise questions oriented towards frequency of behaviour, while self-efficacy scales tend to be more about personal opinion /perception and have a higher level of uncertainty.

It has to be taken into account that underlying data remain correlational in nature as is the case in almost all the studies about motivation-achievement cycles (Vu et al. 2021). Future studies could, as already mentioned, use qualitative research to understand the background of relevant factors but could complement or replace self-reporting questionnaires and this is -considering the importance of this factor- especially the case for the measurement of self-regulated learning (Zimmerman 2011).

Further research could also try to combine change patterns of more motivational constructs: self-efficacy and task value (Johnson et al. 2014) or goal orientation and self-efficacy (Downes et al. 2021). It would also be interesting to research the self-efficacy (Schunk and DiBenedetto 2020) and causal attribution of teachers (Brun et al.2021). A more extensive elaboration of the research agenda can be found in the recent publications of Vu and her colleagues (2021) or Koenka (2020).

## 7. Practical Implications

The results of our study could help teachers to increase their understanding of the motivational processes of first-year students. These insights could help to influence students' attributions and self-efficacy through instructional design or feedback.

Special attention could be paid to directing unsuccessful students to more appropriate attributions and, at the same time, teachers could try to make these students' self-efficacy beliefs more realistic. It is possible that students need more practice tests to improve this calibration (especially for courses that are new to them)

Educational practices could focus more on the enhancement of self-regulated learning. In doing so the decline in self-efficacy for self-regulated learning could be stopped for many students. All this can be done with lots of exercises as mastery experience is the most powerful source of enhancing self-efficacy (Bandura 1997). An additional feedback dialogue in front of the class could thereafter model the right attributions and future actions. This could lead to improved metacognition and self-regulated learning and to less dropping out Haynes et al 2009).

Taken as a whole, this study provides a nuanced contribution to existent literature and has concrete practical implications. The study uses an authentic situation, taking measurements before and after exams, and does not ask participants to imagine a situation as do some other publications (Gordeeva et al. 2020). It provides many suggestions for further research.

## Educational Relevance Statement

This study holds significant educational relevance as it delves into the motivational processes of first-year students, offering valuable insights for educators. By understanding the factors influencing students' attributions and self-efficacy, teachers can tailor instructional designs and feedback to positively impact student outcomes. The findings suggest a targeted approach for guiding struggling students towards more appropriate attributions while concurrently fostering realistic self-efficacy beliefs, potentially through increased exposure to practice tests in novel courses. Furthermore, the study advocates for a heightened focus on enhancing self-regulated learning practices, aiming to halt the decline in self-efficacy for this crucial skill among students. The incorporation of mastery experiences, supported by feedback dialogues, not only aids in modelling correct

attributions but also contributes to improved metacognition and self-regulated learning, potentially reducing dropout rates. Overall, this study not only enriches the existing literature but also provides practical implications for educators seeking to optimize their teaching strategies, emphasizing the importance of authentic measurements and offering avenues for future research exploration.

### **Competing interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### **Informed consent**

Obtained.

### **Ethics approval**

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

### **Provenance and peer review**

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### **Data availability statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### **Data sharing statement**

No additional data are available.

### **Open access**

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