

## Master's Thesis

# What Does It Take to Be a Self-Directed Learner? Factors And Toolkit Intervention for University Students

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## **Abstract**

Existing research shows the importance of self-directed learning (SDL) skills for academic success in university. Existing mechanisms of SDL focus primarily on the process and individual attributes in traditional face-to-face classrooms. With the vast amount of technological advancement, present-day university education is continuously shifting its teaching and learning methods. This means that any effort attempting to instill SDL among university students needs an updated theoretical framework that fits the current learning practices. This paper is divided into two parts. In the first part, the theories related to SDL are revisited to introduce a research-based framework for understanding SDL in the present-day university learning context. The model is validated using pre-existing data consisting of a large sample of students from a university in The Netherlands. Subsequently, in the second part, an intervention is developed based on this framework where a single variable, competence, is targeted. We tested the effectiveness of this intervention on students from the same university. Implications for future studies are discussed at the end of the paper.

## **What Does It Take to Be a Self-Directed Learner? Factors And Toolkit Intervention for University Students**

*Self-directed Learning (SDL)* is critical to university students' personal development (Boyer et al., 2014). Tepper and Yourstone (2018) argued that academic success in university does not stop at getting a high-Grade Average Point (GPA) but also leaving the educational experience with a broader range of skills, attitudes, and knowledge. Notably, in university, with most students transitioning from adolescence to adulthood, universities serve as a critical avenue for students' personal and professional development - from dependence to independence (Grolnick & Raftery-Helmer, 2015; Wang & Eccles, 2011). University education endorses an independent learning style where courses are structured in a way that expects students to engage outside of course contact hours (Theobald, 2018). For instance, courses typically provide reading materials where their completion is not checked in a traditional way (i.e., students are not sanctioned by grades). In this sense, students' ability to plan, direct, initiate, and regulate their learning plays a huge role since they are faced with daily educational demands (e.g., preparation for classes, required readings, homework, and lecture revisions). They consciously or subconsciously make choices about how and where they direct their energy, time, and attention, that is, their level of self-direction (Loeng, 2020). Hence, in the face of the ever-broadening demands on students' learning, universities desiring to equip students with tools that would serve them in their learning would have to invoke opportunities to supplement students to be self-directed learners.

### **Self-Directed Learning**

Before we delve more into SDL, it is first helpful to understand what the term refers to in the context of university education. Although the meaning of SDL may seem straightforward at first, a closer look into past literature reveals the concept's ambiguity (Dehnad et al., 2014).

First, Loeng (2020) defined the term as "a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes."

Second, SDL typically relates to *self-regulated* and *self-paced learning*, which are commonly used interchangeably in the literature. However, according to Robinson et al. (2019), the three terms differ in that the characteristic of SDL incorporates both identification of learning goals and identification of learning resources to accomplish such goals. With self-paced, it occurs when students are given a deadline to complete an academic task but are free to do that at their own pace (Robinson et al., 2019)—for instance, giving students a week to read a chapter before the following lecture is self-paced because students choose the timing and order of the to-be-learned material. Although autonomy is present in self-paced learning, the teachers form the learning goals and give the necessary resources. In a similar vein, self-regulation occurs when students consciously manage their affective, cognitive, and behavioral impulses to achieve a desired level of academic achievement. However, self-regulation does not necessarily require students to identify their own learning goals because the goals are set by their teachers (Saks & Leijen, 2014).

Third, some researchers perceive SDL as an attitude and capacity toward independence in learning (Morris, 2019), while others perceive it as a multifaceted construct (Candy, 1991) encompassing four aspects: "a personal attribute (*personal autonomy*), willingness and capacity to conduct one's own education (*self-management*), a mode of organizing instruction in formal settings (*learner-control*), and a non-institutional pursuit of learning opportunities in the natural societal setting (*autodidaxy*)" (p.23). Beard (2014) goes the furthest in accentuating SDL as a manifestation of learning engagement, that is, characterized by *vigor* (i.e., the high

levels of energy and willingness to invest effort while working on a task), *dedication* (i.e., a sense of significance, pride, and challenge towards a task), and *absorption* (i.e., being fully immersed that one feels carried away when engaging with a task).

Indeed, many perceptions are basing the concept of SDL. Dehnad et al. (2014) concluded that there is no consistency in defining it and that different descriptions suggest that the literature lacks a conceptual framework. Van der Walt (2019) noted that terminological confusion leads to comprehension difficulties when discussing SDL. Taken together, we boiled down the definition of the construct, that is, having the requisite self-awareness and motivation to be engaged in learning by actively taking the responsibility to determine one's own learning needs.

### **Why SDL?**

At present, especially following the COVID-19 pandemic, the way university students engage with their learning has changed, and they are forced to adapt to various learning processes (Al-Kumaim et al., 2021). For instance, some university courses are now delivered through blended-learning methods, flipped classrooms, web-based courses, and computer-based instructional units. Hill et al. (2009) highlighted that, while there is a lot of flexibility and convenience, the nature of present-day education makes it easy for students to lose engagement and motivation to take the initiative in their learning. Given the ever-continuing incorporation of technology within university education, university students are increasingly expected to take more ownership and initiative in their learning than usual (Mahlaba, 2020). In reality, however, even with online education, many universities are continuing to teach under the same teacher-centered, and teacher-dependent approach, where the learning goals are set by the teachers and students are “spoon-fed” (Guglielmino, 2013). For instance, online classes

are still conducted with minimal effort to incorporate the development of attitudes toward learning and the intention to use learning strategies among students (Sun et al., 2022). Consequently, undue attention in research in a university context has been given to the teaching side of the educational process.

Adding to this problem, to date, many psychological models that are used to guide educational interventions are based on the predominant method of traditional classrooms, which are no longer adequate in the world of information navigated through the internet (Gorshkova, 2021). This means that SDL and the associated concepts need updating to reflect the skills and attitudes necessary for university students to thrive in their university academics and the fast and constantly changing world in the 21<sup>st</sup> century.

Accordingly, we sought to revisit the concept of SDL and explore a way to promote it in the present-day university context. In the first part of this study, we integrated existing perspectives and related theories on SDL that are discussed in the literature review section of this paper. Here, we proposed and tested a research model for SDL. Following that, in the second part of the study, we developed an intervention based on the proposed research model and tested its effectiveness in promoting SDL among university students.

## **Literature review**

### **Factors of SDL**

As a starting point, we investigated two main related constructs, self-determination theory and future perspectives theory. We chose these constructs due to their abundance in the educational literature and their widely used application in the university context. While the literature itself may not infer directional relationships, the underlying theory of those links lends sound justification for expectancies of their usefulness in understanding SDL.

#### ***Self-determination***

The concept of self-determination stems from Ryan and Deci's (2000) Self-Determination Theory (SDT). SDT plays a significant role in providing an overarching motivational framework, specifically in educational psychology, as it explains the sources of students' self-determined motivation as being derived from their intrinsic needs-satisfaction; relatedness, autonomy, and competence (Ryan and Deci, 2000). The connection between self-determination and self-direction is explicit and direct, with self-direction being viewed as arising from a mindset of self-determination (Gourlay, 2015; Mitchell, 2011). In the following, we discuss how each element within the SDT contributed to the enhancement of SDL.

#### ***Relatedness***

The concept of relatedness refers to the need to experience oneself as connected to other people (Ryan & Deci, 2000). Fulfillment of the need for relatedness in the university context is expressed when students feel valued, supported, and cared for by their peers and teachers within the school community (Wang et al., 2019). As mentioned by (Candy, 1991), "knowledge

. . . is socially constructed and . . . accordingly learning is a social process . . . self-direction does not necessarily imply solitary learning" (p. 367). This means that the development of SDL occurs within a social environment. Mentz and Van Zyl (2018) found that a collaborative learning environment, where the opportunity for dialogic feedback and encouragement is advocated, supports the development of students' self-assessment skills. This is because such an experience allows students to seek others with similar learning needs to clarify complex learning material and to share knowledge, experiences, and resources with them (Merriam, 2022). Lubbe and Mentz (2019) went further and added that close relationships with peers and teachers provide students with an avenue to exchange knowledge about effective and ineffective learning practices, which, in turn, help them to diagnose their learning needs and make alterations to their learning strategies. Since the ability to view peers and teachers as learning resources and ultimately learn from them, is fundamental to the development of SDL (Momani, 2017; van der Walt, 2019), students who perceive such support (i.e., relatedness satisfaction) from both peers and teachers would possess a higher SDL.

### ***Autonomy***

The concept of autonomy refers to an inner endorsement of one's behaviors - the sense that actions originate from the self (Ryan & Deci, 2000). As noted by (Deci & Ryan, 1987), people have the propensity to direct themselves toward personal growth, which initiates, directs, and regulates their behavior. Autonomous behavior is thus selected not merely as a cognitive-based decision among behavioral options (Deci & Ryan, 1987) but rather as a representation of personal identity and goals (Brehm, 2013). In this sense, the more autonomous the behavior, the more it represents the self (i.e., interests, goals, personal values, and identity). It is experienced as a decision for which one feels responsible (Katz & Assor, 2006). Baldan Babayigit and Guven (2020) emphasized the importance of allowing university

students to choose their learning paths, and plan and implement these plans independently. Additionally, Eschenbacher and Fleming (2020) noted that in this age of COVID-19, students are experiencing learning disengagement, originating from having lost their sense of direction in the world and control over their academic trajectory. Because of this, students with higher levels of autonomy should be more likely to engage in SDL.

### ***Competence***

The concept of competence refers to a need to experience oneself as effective when engaging in a task (Ryan & Deci, 2000). Competence is closely tied to the self-efficacy theory, which postulates that when one believes that they can be successful and perform well, they have the confidence to approach different tasks with the belief that they are capable of producing desirable results (Bandura, 1985). According to Cerasoli (2016), competence builds self-confidence, and this consequently provides students with the motivation to apply what they have learned. This is supported by Lent and Brown (1996), who highlighted that “people form an enduring interest in an activity when they view themselves competent at it ...” (p. 313). Therefore, not only is competence closely associated with the perception of the ability to achieve a learning goal, but it also induces goal orientation, increasing the tendency to plan and take the initiative. Consequently, this reflects the ability to take responsibility in learning, which is associated with SDL.

### ***Future-orientation***

The concept of future orientation stems from the Future Time Perspectives (FTP) construct, which refers to the integration of the chronological future into the present through motivational goal-setting processes (Husman & Lens, 1999). According to Miller and Brickman (2004), when people commit themselves to personally valued goals reflected in the

future, they are more likely to purposefully generate a coherent path of subgoals to guide their action in the direction toward the achievement of those goals, and this raises the level of involvement. Additionally, Zimmerman (1989) noted that students without a plan of concrete subgoals for achieving their future goals tend to be guided by immediate needs and temptations. Wang et al., (2021) referred to this as the lack of cognitive evaluation of the immediate context, reflecting the lack of self-observation, self-evaluation, and self-monitoring fundamental to SDL. These perspectives addressed the importance of future orientation as a factor that leads to SDL. They imply that proactive students (typically those who are self-directed and high achieving) are driven by future goals. Therefore, it is expected that future orientation will facilitate the development of SDL.

In sum, SDL as a construct is closely aligned with the theoretical framework of SDT and FTP. In this sense, relatedness, autonomy, competence, and future orientation embody various patterns of self-monitoring, planning, as well as students' motivational beliefs that lead to the development of SDT.

## Study 1

In the current study, we integrated the previously discussed existing literature on the related theories and factors that led to the development of SDL in the university context. Six hypotheses are derived and tested to develop an updated SDL model based on the literature review. Our hypotheses regarding these expected relationships are outlined in Table 1, and the updated SDL model, contextualized to fit the present-day university education, is represented in Figure 1.

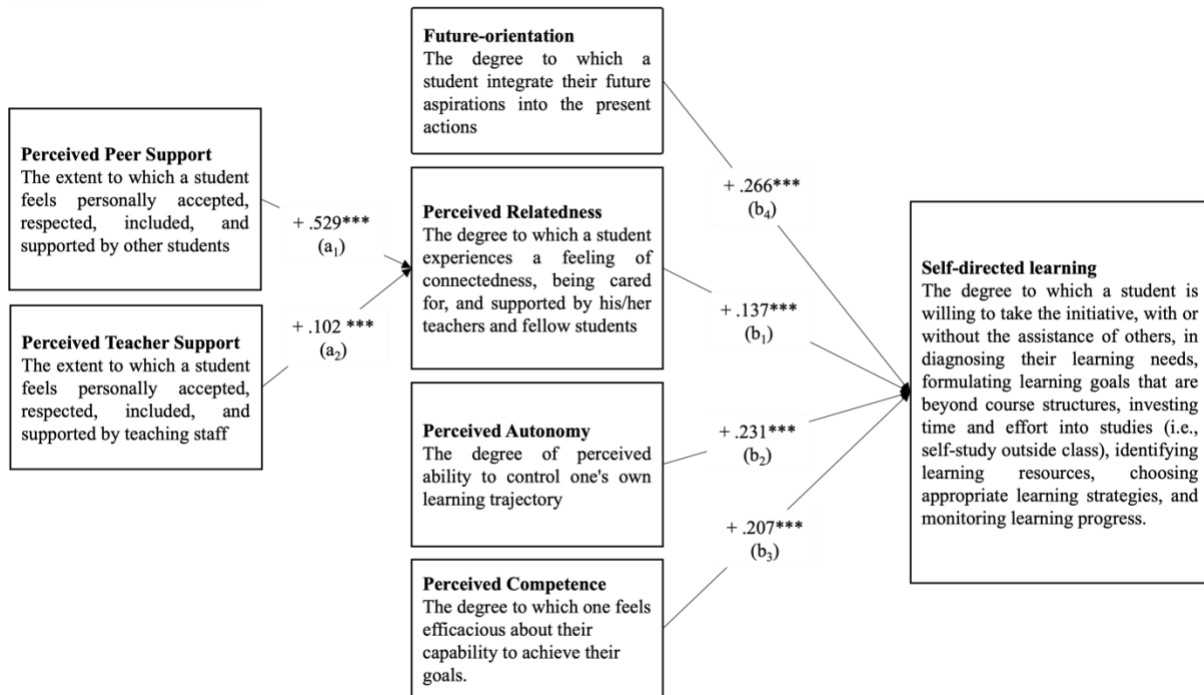
**Table 1**

*Hypotheses of Study 1*

<b>Hypothesis</b>	<b>Supporting References</b>
H1: Higher perceived peer support predicts greater relatedness (Path a <sub>1</sub> )	Candy, 1991; Lubbe and Mentz, 2019; Mentz and Van Zyl, 2018; Merriam, 2022; Momani, 2017; Ryan & Deci, 2000; van der Walt, 2019; Wang et al., 2019
H2: Higher perceived teacher support predicts greater relatedness (Path a <sub>2</sub> )	
H3: Higher relatedness predicts greater SDL (Path b <sub>1</sub> )	
H4: Higher autonomy predicts greater SDL (Path b <sub>2</sub> )	Brehm, 2013; Baldan Babayigit & Guven, 2020; Deci & Ryan, 1987; Eschenbacher & Fleming, 2020; Katz & Assor, 2006
H5: Higher competence predicts greater SDL (Path b <sub>3</sub> )	Bandura, 1985; Cerasoli, 2016; Lent & Brown, 1996; Ryan & Deci, 2000
H6: Higher future-orientation predicts greater SDL (Path b <sub>4</sub> )	Husman & Lens, 1999; Miller and Brickman, 2004; Zimmerman, 1989; Wang et al., 2021

*Note.* This table outlines the hypotheses and their respective supporting references to be tested in Study 1, derived from the literature review.

Figure 1



Note. This figure represents the proposed hypothesis to be tested in Study 1

## Method

### Participants

Before the investigation was conducted, a priori power analysis was carried out using G\*Power 3.1 software (Faul et al., 2009). It was estimated that, given that there are six independent variables, 39 participants would be needed to validate a power of 80% (Type 1 error = 5%,  $f^2 = .42$ ).

For this study, we used existing data from a pool of participants who took part in a large-scale Student Wellbeing Survey (SWS) conducted at the Radboud University Nijmegen ( $N = 4902$ ;  $M_{\text{age}} = 22.6$ ;  $SD_{\text{age}} = 4.2$ ). This survey was a part of the Healthy Student Life project, a longitudinal study on student well-being at Radboud University. The project was conducted

in accordance with the Declaration of Helsinki, and the study procedures were approved by the Ethics Committee Social Sciences of Radboud University, Nijmegen, The Netherlands (ECSW-2021-086). 387 (7.9%) students did not report their gender. For the rest of the data, the descriptive statistics of the population data classified by gender are outlined in Table 2. Additionally, students from diverse backgrounds and course choices were able to take part in the survey. A brief description of participants' backgrounds is outlined in Table 3.

**Table 2**

*Descriptive statistics of data in Study 1*

<b>Gender</b>	<b><i>N</i></b>	<b>Percentage (%)</b>	<b><i>M</i><sub>age</sub></b>	<b><i>SD</i><sub>age</sub></b>
Female	3239	66.1	22.5	4.2
Male	1207	24.6	22.8	4.3
Non-Binary	69	1.4	21.6	2.5

*Note.* This table demonstrates the analysis of descriptive statistics of data obtained for Study 1. It is classified by gender. All numbers are rounded to one decimal place.

**Table 3***Descriptive statistics of participants in Study 1.*

<b>Faculty</b>	<b>N</b>	<b>Percentage (%)</b>
Faculty of Law	446	9.1
Faculty of Arts	607	12.4
Faculty of Science	774	15.8
Faculty of Social Science	1469	30.0
Radboud University Medical Center	595	12.1
Nijmegen School of Management	802	16.4
Faculty of Philosophy, Theology and Religious Studies	199	4.1
Radboud Teachers Academy	10	0.2
Total	4902	100

*Note.* This table demonstrates the analysis of descriptive statistics of participants in Study 1. The table shows that the sample contains students of diverse faculties within Radboud University.

## **Materials**

The questionnaires included demographic information (e.g., sex, age, faculty, start year, and current year) and items from various scales that reflect various dimensions of student wellbeing. For this study, we selected only some of the scales in the survey (see Appendix A) to represent the variables in the hypothesized research model. Both the Dutch and English languages were used in the survey.

### ***Perceived peer and teacher support***

Two items in the Social Support questionnaire were used to assess the extent to which students experience social support from peers and teachers. The items were "to what extent do you experience social support from your fellow students" and "to what extent do you

experience social support from your teachers." The participants responded to these items on a 10-point Likert scale (1 = very little support, 10 = a lot of support).

### ***Autonomy, Relatedness, Competence.***

The Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2014) was used to measure autonomy (Cronbach's  $\alpha = .56$ ), relatedness (Cronbach's  $\alpha = .76$ ), and competence (Cronbach's  $\alpha = .80$ ). Examples of these items include the following: autonomy satisfaction (e.g., "I feel a sense of choice and freedom in the things I undertake at school"), relatedness satisfaction (e.g., "At school, I feel that the people I care about also care about me"), competence satisfaction (e.g., "I feel confident that I can do things well at school"). The participants responded to these items on a 5-point Likert scale (1 = totally disagree, 5 = totally agree).

### ***Future-orientation***

A self-constructed scale (3 items) for Future Perspective (Cronbach's  $\alpha = .75$ ) was used to assess the extent to which students perceived their studies as instrumental for their goals in the future. Examples of these items include the following: "My study program prepares me well for a future career," "I have a clear goal in mind regarding my future career," and "I am confident that I will find a suitable job after my graduation." Participants responded to these items on a 10-point Likert scale (1 = strongly disagree, 10 = strongly agree).

### ***Self-Directed Learning***

The Utrechtste Bevlogenheid Schaal (UBES-S-9; Schaufeli et al., 2006) was utilized to measure students' levels of Self-Directed Learning. The scale (Cronbach's  $\alpha = .91$ ) is a 9-item self-report scale grouped into three subscales with three items each: vigor (VI), dedication

(DE), and absorption (AB). Examples of these items include the following: vigor (e.g., "When I study, I feel like I am bursting with energy"), dedication (e.g., "I find my studies to be full of meaning and purpose"), absorption (e.g., "Time flies when I am studying"). All items are scored on a 6–point Likert scale (0 = never, 6 = always).

## **Data Analysis**

Before conducting the investigation, we performed a priori power analysis using G\*Power 3.1 software (Faul et al., 2009). Subsequently, existing data from the Healthy Student Life project was exported to IBM SPSS (v.28) software for analysis. A test was conducted to determine whether multiple regression analysis would be applicable. Durbin-Watson (D-W) statistics were used to test the autocorrelations between variables, and the result was  $D-W = 2.02$ . As this value is in the range of 1.5 to 2.5, we can assume that there are no autocorrelations found between the variables (Field, 2018). Next, an analysis of descriptive statistics and frequencies was carried out. Subsequently, we conducted a reliability test for each scale to obtain Cronbach Alpha values. Lastly, we conducted a multiple-regression analysis where we omitted outliers (i.e., data outside three standard deviations) in the process. 14 outliers were found in the data set.

## **Results**

We derived six hypotheses for developing a research model (Figure 1). After controlling for their common variance, the predicted relationships were investigated. The standardized regression ( $\beta$ ) coefficients are reported in Table 4 as well as on the paths in Figure 1. We found that perceived peer support ( $\beta = .53$ ) and teacher support ( $\beta = .10$ ) significantly predict relatedness. Accordingly, Hypothesis 1 and Hypothesis 2 are confirmed. Additionally, self-directed learning was significantly correlated with relatedness ( $\beta = .16$ ), autonomy ( $\beta =$

.23), competence ( $\beta = .21$ ), as well as future-orientation ( $\beta = .27$ ). Therefore, Hypotheses 3, 4, 5, and 6 are confirmed.

In essence, our data demonstrated that, first, perceived peer support and teacher support significantly predict relatedness satisfaction, and second, relatedness, autonomy, competence, and future perspectives significantly predict SDL. Altogether, the findings validate our proposed SDL model (Figure 1).

**Table 4**  
*Regression Analysis Study 1*

		Standardized $\beta$	$t$	$p$	95% CI for $\beta$	
					Lower Bound	Upper Bound
<b>H1</b>	Perceived Peer Support	.53	32.25	<.001	.21	.24
<b>H2</b>	Perceived Teacher Support	.10	6.23	<.001	.03	.06
<b>H3</b>	Relatedness	.16	8.32	<.001	.12	.20
<b>H4</b>	Autonomy	.23	14.80	<.001	.28	.37
<b>H5</b>	Competence	.21	13.37	<.001	.23	.31
<b>H6</b>	Future-orientation	.27	18.92	<.001	.16	.20

*Note.* This table demonstrates the results obtained from regression analysis for Study 1.

## Discussion

Previous studies on SDL emphasized that students must have minimum control over their learning. However, considering all sides of the matter, SDL is not only primarily about learning autonomy. Our investigation demonstrated that elements from two main related constructs, SDT and FTP, are fundamental to SDL development. This study aimed to seek empirical evidence of these elements in promoting SDL among university students. Several findings that emerged from the study are discussed below.

First, our results indicated that relatedness is a product of perceived peers' and teachers' support. Subsequently, this sense of relatedness predicts SDL. This confirms Johnson and Johnson's (1999) findings that not only do students benefit from feeling cared for through the shared experiences, opinions, and ideas provided by other students, but such experience also trains their cognitive organizing, processing, and higher-level reasoning through selecting and filtering irrelevant information. In addition, our results also revealed that perceived peer support is a more robust predictor of relatedness than perceived teacher support among university students. Perhaps, presence, encouragement, and the opportunity for resource exchange from peers are more readily available than from teachers (Johnson & Johnson, 1999). This leads to students perceiving a greater sense of reciprocity and, subsequently, relatedness satisfaction from their peers.

Additionally, it could also be that students identify with their peers' experiences more than teachers because their peers' experiences are more relevant to them (Shteynberg & Apfelbaum, 2013). Such an experience instills a greater sense of safe and supportive space, which draws greater emotional connection (i.e., relatedness) in the learning process (Johnson & Johnson, 1999). One important implication is that, since perceived peer support highly predicts relatedness and SDL, opportunities that allow students to bond with their peers in the

learning process would greatly nurture their SDL. Nevertheless, because the relationship between perceived peer support and SDL is mediated by relatedness, it is not clear if the robustness of the effect of perceived peer support (as compared to teachers') is due to the identification with the shared experience or the fact that peers are generally more readily available as compared to lecturers or teachers. Having relatedness as a mediator means that SDL would be more prominent among university students if caring is generally recognized in the learning process. Hence, it might not particularly come from teachers or peers per se. For instance, Mentz and Van Zyl (2018) found that students are more likely to adopt help-seeking strategies in a learning environment where teachers are perceived as approachable. This supports Karatas and Arpaci's (2021) argument that it is the discoveries, the ideas of others, and the opportunity for feedback and sharing experiences that accommodate the development of SDL, not from whom they are received. Therefore, further research can uncover the role of availability versus experience-identification from teachers and peers in facilitating relatedness and the subsequent SDL among university students.

Next, as expected, our results also revealed that autonomy and future orientation predicts SDL. These findings reinforce the importance of constructivist beliefs to the development of SDL, as suggested by previous studies (e.g., Baldan Babayigit & Guven, 2020; Christensen & Hooker, 2000; Du Toit-Brits, 2018). Hence, by reporting similar findings in the context of a Dutch university, our findings add to the generalizability of the importance of developing autonomy and future orientation in promoting SDL among university students. According to Miller and Brickman (2004), when students are future-oriented, they tend to purposefully generate a coherent plan of action to achieve that. Together with autonomy, it is possible that it is the rewarding essence (induced positive emotions) of feeling in control of one's actions while making a coherent plan that highly contributes to students' extent of

willingness and intention to exert effort and commit to learning. Past research has shown that the opportunity to exert control and the act of choosing itself carry intrinsic value (Leotti et al., 2010) because it carries subjective positive feelings that are tied to reward-related processing in the brain (Meng & Ma, 2015; Wang & Delgado, 2019; Stolz et al., 2020). In essence, our findings seem to lend support to the notion that autonomy satisfaction and future orientation effectively bear a positive decisional value that biases self-direction. A practical implication from this is that students should be able to engage in deep reflection and evaluate their future goals and be encouraged to perceive learning as their own choice. Therefore, students will greatly benefit if they perceive learning is undertaken out of their own choice and from activities that reflect their future goals.

Furthermore, our results revealed that competence predicts SDL. This supports Lee and Pant's (2020) findings that the pursuit of mastery (i.e., competence satisfaction) influences students' effort and willingness to apply different learning strategies, which are concepts related to SDL. By contrast, students are unlikely to be self-directed in a learning domain (or tasks) where they feel incompetent. In pursuit of self-competence, students may evaluate both expectations of the learning activity and their actual performance (Orsini et al., 2016). Such evaluation involves identifying and reflecting on personal abilities, talents, and skills, resulting in a satisfying perception of effectiveness (Legault, 2017). As noted by (Deci et al., 1994), people like to keep track of their progress and performance and strive towards mastery or the pursuit of proficient skills and knowledge. Therefore, students would greatly benefit from an empowering learning environment where they get to feel competent to overcome setbacks and mundane or challenging academic demands.

## **Limitation**

Beyond the validation of the proposed research model, it should be taken into account that the current study has some important limitations. First, it is noteworthy that our study relied heavily on student self-reports. Notably, we focused on the internal processes in measuring SDL as an outcome variable. In this sense, students' subjective evaluation of their experience was our source of information. However, relying on self-reports in assessing perceptions related to their learning raises a critical validity concern where students could answer questions about their behavior or that of themselves in ways, they think would be socially desirable (Veenman, 2011). Future investigation should consider including multiple sources of measures (teachers, study advisors, university counselors), as well as other methodologies (e.g., interviews, field observations), which will provide a more valid and robust method of identifying individual factors related to SDL.

Furthermore, learning behaviors are generally likely to take different forms across different educational years (Bakadorova & Raufelder, 2017). Future investigation of longitudinal studies across different years of study would be helpful in clarifying whether the findings derived in this study were unique to our sample at this given time or whether it can be generalized into a universal developmental trajectory for SDL across university life. A more in-depth articulation of SDL's developmental effects will help inform interventions to support university learning during different study years. Additionally, the majority of our data was female students should be considered since gender bias cannot have been avoided entirely. Besides, the data used in our research were collected from a single university in The Netherlands. Hence, it may not be generalized to other institutions and countries. Further studies should consider the distribution of males and females and incorporate students from various universities during the sample recruitment phase.

## Study 2

Following Study 1, the second phase of the study attempted to evaluate the utility of a learning toolkit intervention. The intervention was developed to target the competence variable in the research model proposed and tested in Study 1. Our reasoning behind this is twofold. First, upon reviewing the literature on past intervention studies in an educational context, we found the majority of these studies documented the malleability of competence as a construct (e.g., Dougherty & Sharkey, 2017; Durlak et al., 2011; Greenberg et al., 2003; Zander et al., 2018). The implicit message is that perceived competence is highly malleable, and therefore targeting it in interventions would likely have the most utility. Second, previous research indicates that among the other SDT elements, competence has the strongest link to goal-setting behaviors (Cerasoli et al., 2016; Pilling-Cormick and Garrison, 2013). Particularly, Pilling-Cormick and Garrison (2013) noted that students' effort and willingness to apply different learning strategies, which are concepts related to SDL, are significantly predicted by competence because it also embodies a sense of control and responsibility. In sum, numerous theoretical perspectives highlight the importance of competence for the outcomes of focus in the current intervention.

Two widely used competence-targeting interventions were used as the guiding principles for developing the learning toolkit intervention in this study; Growth Mindset Intervention (GMI) and Value Affirmation Intervention (VAI). Both interventions are discussed in the following.

The core of GMI is based on the idea that interventions promoting a growth mindset can aid in changing students' beliefs about the nature of their learning abilities, providing them with the perspective that their learning process and outcomes can improve with the amount of

effort they put in (Dweck & Leggett, 1988). Yeager et al. (2016) found that a brief GMI exercise delivered through an online platform led to better academic performance for university students because such an intervention could sufficiently change students' perceptions of academic challenges. A GMI design typically involves sessions on brain plasticity and reflecting on how individuals perceive themselves and their values (Brougham & Kashubeck-West, 2017; Paunesku et al., 2015). Bostwick and Becker-Blease (2018) noted that when students understand the positive benefits of malleable mindsets, they tend to perceive greater competence and take more responsibility for their learning. Therefore, growth mindset messaging entails that everyone has the ability to succeed even in times of challenges or when experience is lacking and serve as a potent and indirect message that development is possible.

Similarly, the fundamental idea underlying the VAI exercise is the notion that people have a psychological need to preserve self-integrity and a sense of personal adequacy (Sherman, 2013). Often, this self-integrity is challenged by psychological threats (e.g., feeling incompetent because of a lack of experience), and individuals can often make aversive attempts and thus detrimental to their progress. Research has shown that these detrimental ramifications can be overcome if people reaffirm a highly valued aspect of their identity unrelated to the threat (Critcher & Dunning, 2014). VAI studies typically involve a brief reflection that asks participants to choose and write about the most important values from a list of values (e.g., love, discipline, honesty). Since values are fundamental to one's sense of self-integrity, expressing one's advocacy to them is a simple and effective way to affirm self-integrity (Sherman, 2013). Such an exercise encourages students to take a broader perspective and be reminded of what means the most to their authentic selves in a self-reinforcing narrative (Cohen & Sherman, 2014). The effectiveness of self-affirmation in promoting university learning performance has been documented (e.g., Creswell et al., 2013; Easterbrook et al., 2021).

According to Landau et al. (2014), the reasoning behind this is that when students generate a self-reinforcing narrative about their values, it enables them to transcend concerns about their self-worth. Subsequently, this confidence is translated into their sense of competence through the perception that their goal is attainable through a coherent sequence of behaviors that begins in the present (Landau et al., 2014). Therefore, using VAI can strategically energize students to take the initiative in their learning.

Taken together, experimental studies within an educational context incorporating VAI and GMI noted the importance of competence for choosing to take the initiative, persist, and persevere in one's learning progress. In this study, we built upon Dweck's (2022) and Steele's (1988) initial success with GMI and VAI (respectively) to test a brief, low-intensity, and cost-effective intervention that could be easily distributed to students using a double-blind, randomized experimental design. Here, we targeted students' sense of competence, that is, subjective beliefs about their learning abilities. The intervention took place in the middle of their fourth period of study, was administered in an online orientation, and comprised a 20-minute set of exercises which, firstly, provided knowledge about how people's brains can grow and adapt in response to learning opportunities, secondly, provided the opportunity to reflect on personal values, thereby constructing a 'big picture goals' which stimulates their adaptive learning system and cognitive reappraisal toward their competence, lastly, imparted some specific study tips for learning impulse control issues (e.g., procrastination). The study comprised control (no intervention) and experimental (intervention) conditions. While the participants in the experimental condition were prompted with the toolkit intervention (see Appendix C), participants in the control group were prompted with a series of written exercises that did not incorporate any GMI and VAI elements (see Appendix D). After the delivery of

the exercises, self-reported competence, as well as learning intentions that represent SDL, were assessed.

Given the context, Study 2 incorporates principles of evidence-based programs that reflect on sound pedagogical practices in university education (e.g., Nation et al., 2003; Weissberg et al., 2003) to aid meaningful learning and retention of information. Specifically, the intervention is structured around a systemized outline of the '*Prepare-Generate-Reflect-Closure*' procedure proposed by Martin (2008). Further breakdown of the outline is accounted for in the method section of this paper. Hence, in addition to testing the utility of a toolkit intervention that targets students' competence, this study also applies the demonstrated tradition of sound pedagogical practices.

## **Hypotheses**

We predicted that students who did the toolkit intervention (intervention condition) would earn higher scores on competence than students who did not do the toolkit intervention (control condition; H1), and students who did the toolkit intervention would show higher scores on SDL than students who did not do the toolkit intervention (H2).

## **Method**

### **Participants**

Before the experiment was conducted, a priori power analysis was carried out using G\*Power 3.1 software (Faul et al., 2007, 2009). It was estimated that given the sample allocation ratio is 1:1, 278 participants (139 samples each condition) would be needed to validate a power of 80%, a Type 1 error of 5%, and an effect size of 0.3. The effect size was an average value derived from recent papers on the successful effects of GMI (e.g., Carvahlo

& Skipper, 2019; Paunesku et al., 2015; Yeager et al., 2016) and VAI (e.g., Goyer et al., 2017; Hanselman et al., 2017; Miyake et al., 2010).

Unfortunately, due to time constraints, we could only recruit participants within three weeks. A total of 197 students participated in the study. However, a final sample of 137 students who met the inclusion criteria (completed the survey) was included in the analysis (age range = 17-28,  $M_{\text{age}} = 20.80$ ,  $SD_{\text{age}} = 2.32$ ). The sample descriptive statistics (classified by gender) are outlined in Table 5. 71 students were assigned to the experimental group (intervention), and 66 were assigned to the control group (no intervention). Following this, a sensitivity power analysis was carried out ( $d = .14$ ,  $\alpha = .05$ , power = .80).

A broad range of study backgrounds was represented in the sample. Thus, the study participants came from diverse programs and years of study (see Table 6). All participants were from Radboud University Nijmegen and were enrolled in the courses offered by the university.

**Table 5**  
*Descriptive statistics of participants in Study 2*

<b>Gender</b>	<b><i>N</i></b>	<b>Percentage (%)</b>	<b><math>M_{\text{age}}</math></b>	<b><math>SD_{\text{age}}</math></b>
Female	106	77.4	20.7	2.2
Male	28	20.4	21.1	2.8
Non-Binary	3	2.2	20.7	2.1

*Note.* This table outlines the descriptive statistics of participants in Study 2, classified by gender. All numbers are rounded to one decimal place.

**Table 6***Study 2 Participants Faculty and Year of Study*

<b>Faculty</b>	<b><i>N</i></b>	<b>Percentage (%)</b>
Faculty of Law	1	0.7
Faculty of Arts	12	8.8
Faculty of Science	9	6.6
Faculty of Social Science	108	78.8
Radboud University Medical Center	2	1.5
Nijmegen School of Management	3	2.2
Faculty of Philosophy, Theology and Religious Studies	1	0.7
Not reported	1	0.7
<b>Total</b>	<b>137</b>	<b>100</b>
<b>Year of Study</b>	<b><i>N</i></b>	<b>Percentage (%)</b>
First-year Bachelor	78	56.9
Second-year Bachelor	22	16.1
Third-year Bachelor	11	8.0
Fourth-year Bachelor	1	0.7
First-year Master	18	13.1
Second-year Master	7	5.1
<b>Total</b>	<b>137</b>	<b>100</b>

*Note.* This table shows the faculty background and year of study of participants in Study 2.

## **Procedure**

We advertised recruitment for the study on SONA, an online student research and participation management tool used to set up studies and accredit research participation. Participants signed informed consent statements prior to attempting the experimental procedures. Participants contributed to the study voluntarily and completed the survey online

at a time and place of their choosing. However, as compensation for their time and effort, they were given SONA credits of 0.5 points when needed.

Additionally, we carried out a cash prize lottery worth €50 (3 winners) and €25 (4 winners) for participants who completed the study. The program Behavior Change approved the current research with a corresponding declaration of compliance for storing and managing personal and research data before conducting this research. This was stated in the information letter and in concordance with the General Data Protection Regulation and the national supervisory authorities (Dutch Data Protection Authority and the Netherlands Board on Research Integrity). Accordingly, the Social Sciences Ethics Committee of the Radboud University Nijmegen approved the study as complying with the *Light Track* frameworks established by the Social Sciences Ethics Committee (reference number: ECSW-LT-2022-5-10-46298).

In this study, we experimentally manipulated the presence versus absence of the learning toolkit intervention and its effect on students' competence and, subsequently, their SDL. The independent variable was, therefore, whether the student did (experimental condition) or did not attempt the toolkit intervention (control condition). Upon signing up, participants were randomly assigned to one of the two conditions. Participants filled out a set of questionnaires representing the measurement scales (i.e., competence and SDL) at the end of the exercises. As mentioned above, the materials and scales were delivered in an online orientation via Qualtrics, an online survey platform approved by the Radboud University Nijmegen for use in research. Participants' responses and data were gathered through the platform.

The intervention was designed to build upon key features of previous successful psychological interventions by allowing for easy distribution and convenience, being timed to

take place right before the occurrence of academic challenges in university courses (e.g., final exam), and is fitted into a specific context (university education), allowing students ample opportunity to apply the learned skills into their courses.

## **Material**

### ***The toolkit intervention***

The language of delivery for the intervention condition exercises is English. The intervention started with the preparation unit. The main content of this unit was learning about learning. Participants were first asked to reflect on their habitual self-study behavior (e.g., “How long (in minutes) do you normally study before taking a break?”), followed by information about what considers a good study duration and a visualization of how learning is reflected physically in the brain. This part of the intervention not only gives a brief introduction to learning best practices but also provides fact-based information that learning can be acquired, thereby, boosting their competence.

Next, the main content of the second (*generate*) unit was a value-affirmation exercise, where they were asked to choose three out of a list of 11 values and write about why they chose these values. With the help of this exercise, participants were encouraged to generate a broader perspective of themselves and reminded of what means the most to their authentic selves. This self-reinforcing narrative should guide them to view the many ordinary stressors of their academic life (e.g., the possibility of failure) in the context of the big picture (Schmeichel et al., 2009), which should promote their self-integrity by anchoring a sense of adequacy (i.e., competence) in a higher purpose (Cohen & Sherman, 2014).

The core content of the third (*reflect*) unit is self-awareness in times of procrastination (i.e., delaying and avoiding academic tasks). Here, we covered the topic of procrastination as

it is a ubiquitous phenomenon among students in university (Klingsieck et al., 2013). According to Kljajic et al. (2022), procrastination is not so much a matter of having poor time-management skills, but rather an underlying and more complex psychological reasoning related to irrational thoughts about one's sense of competence. Simply put, procrastination is a self-protection strategy in a form of defensive denial rooted in the fear of being perceived as incompetent (e.g., underperforming, looking stupid; Sirois & Pychyl, 2013). In this exercise, participants were encouraged to acknowledge inner voices that reflect on these familiar and unproductive thoughts. Some examples of these statements are "If I do it tomorrow, it will still be fine", "I just don't feel like studying now" and "This topic is too complex, I lost the desire to learn it now." Paired with the subsequent (closure) unit, this reflection unit would help students respond to such thoughts in a constructive manner by getting students to first reflect on and be aware of their self-narratives.

Following up, in the *closure* unit, students were prompted with a list of strategies on how to overcome procrastination. This list consists of 10 items of advice for planning derived from Smale and Fowlie (2015). Attention is devoted to personal preferences in relation to the student's biorhythm ("Drag and drop each point to rank them from most to least feasible to be done to you"). This exercise provides practical strategies around how to apply this knowledge, particularly during their self-study sessions or when completing their schoolwork. This should give an implicit message that they have the resources in themselves to succeed in their academics if they are willing to regulate their learning behavior.

### ***Control condition task***

Students in the control condition were prompted with three open-ended questions about their general experiences in university. This exercise does not incorporate any of the elements

within GMI and VAI. The details of the questions are outlined in Appendix D. The language of delivery for the control condition exercises is English.

### ***Measures***

All participants, both from experiment and control conditions, attempted a set of self-report questionnaires that measured competence and SDL at the end of the exercises. Each of these measures utilized a 5-point Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree). English was used as a language of delivery.

*Competence.* A set of eight items comprising a combination of two widely used competence scales were used to assess students' perceived competence: the perceived competence subscale in the Intrinsic Motivation Inventory (IMI; Ryan & Deci, 2000) and Perceived Competence Scale (PCS; Harter & Pike, 1984). These items were summed to create an overall competence measure in the university context (Cronbach  $\alpha = .77$ ). This was followed by slight wording modification to refer specifically to the context of university education. For instance, "I feel confident in my ability to learn this material" (item one) was changed to "I feel confident that I can complete my degree in the given time" (see Appendix B).

*Self-Directed Learning.* Participants then completed a 5-point scale to assess their intentions in learning, which reflect their SDL. This portion included 13 items. Each scale started with "I have the intention to...". Example statements are "I have the intention to ask for help with my studies if needed," "...attend classes without completing the reading materials beforehand", and "...watch extra study materials, such as knowledge clips, extra videos, etc" (see Appendix B). These items were summed to create an overall SDL measure in the university context (Cronbach  $\alpha = .80$ ).

## Data analysis

A priori power analysis was conducted prior to the recruitment of participants. Because we did not meet the required sample size within the given time frame of this project, a sensitivity power analysis was conducted after the recruitment. For both power analyses, we used G\*Power 3.1 (Faul et al., 2009).

We extracted the data from Qualtrics and exported it to IBM SPSS 28 for further analysis. Descriptive statistics and frequencies were generated. The incomplete responses were removed from the data. Additionally, a dummy variable is generated to indicate participants assigned to (0) control and (1) experimental conditions. The mean scores for each scale were analyzed and compared using an independent sample t-test analysis.

## Results

A central element of the analysis was to compare the mean of competence and students' SDL between the two conditions (experimental and control). Means, standard deviations, and mean standard errors for competence and SDL of the two conditions are presented in Table 7.

**Table 7**  
*Study 2 Group Statistics*

		<b>N</b>	<b>MEAN</b>	<b>SD</b>	<b>SE MEAN</b>
Competence	Control	66	3.41	.65	.08
	Intervention	72	3.42	.65	.08
Self-directed learning	Control	66	3.67	.49	.06
	Intervention	71	3.69	.57	.07

*Note.* This table outlines the Mean, Standard Deviation (SD), and Standard Error (SE) Mean for competence and SDL of the two conditions (control and intervention) in Study 2. All numbers are rounded to two decimal places

We found a statistically non-significant between-conditions difference on competence ( $M_{\text{diff}} = .01, p = .47, t(135) = .09, d = .02$ ). Therefore, our first hypothesis (H1) is not confirmed. Similarly, data also showed no significant difference ( $M_{\text{diff}} = .02, p = .40, t(135) = .26, d = .04$ ). Therefore, our second hypothesis (H2) is not confirmed. The results of our analysis are outlined in detail in Table 8.

**Table 8**  
*Independent sample t-test analysis*

	<b>Mean Difference</b>	<b>SE Mean Difference</b>	<b>p-value</b>	<b>t</b>	<b>Cohen's d</b>
Competence	.01	.11	.47	.09	.02
Self-directed learning	.02	.09	.40	.26	.04

*Note.* This table outlines the result of the independent sample t-test carried out in Study 2. All numbers are rounded to two decimal places. Cohen's *d* uses pooled standard deviation.

## Discussion

This study aims to test a brief toolkit intervention that includes key elements of two previously successful competence-related interventions (GMI and VAI) in an online orientation. The intervention was designed to increase students' sense of competence before a time of high academic challenge (e.g., final academic year exams) when there were ample opportunities for learning strategies to pay off. We hypothesized that students who received the toolkit intervention would have a greater perceived competence and SDL skills than those who did not receive the intervention (control condition). After examining the results, we found no statistically significant difference between the two conditions' mean scores of competence and SDL.

Despite the evidence-based advantages of GMI and VIA in an educational context, this study found that combining the two interventions was ineffective in terms of promoting competence and, subsequently, SDL among university students. Therefore, our findings did not confirm the proposed hypotheses. Nonetheless, the fact that the students in the experimental condition did not reap significant benefits from the intervention was surprising, given previous research that has demonstrated the benefits of GMI (e.g., Brougham & Kashubeck-West, 2017; Paunesku et al., 2015; Yeager et al., 2016) and VIA (e.g., Creswell et al., 2013; Ferrer & Cohen, 2018; Easterbrook et al., 2021). This appears to result from the time constraints of the project. The recruitment of participants was only possible to be done within the time frame of three weeks. Considering that our experiment was also conducted in the middle of the fourth period of the academic semester, where students are most likely to be preoccupied with their course obligations, recruiting an adequate sample size (i.e., satisfies the priori power analysis) was a challenge.

Another limitation is the fact that the intervention is a brief one-time approach which was a particular deficiency given that the content within our intervention may not be rich enough to provide students with the same experience as, for instance, a full-on intensive training on learning competence (e.g., Blackwell et al., 2007). For instance, some growth mindset interventions included success storytelling and testimonials as this process inspires students and subsequently strengthens competence (e.g., Facer, 2019). However, due to the nature of our intervention being brief and online oriented, the practicality of capitalizing on elaborated content is limited. Had repeated implementation of the intervention been assigned at different time points, the intervention may translate into a different set of findings. Nevertheless, we encourage incorporating a more comprehensive range of supporting materials (e.g., videos of alumni's testimonials) as a part of future interventions. Further, the time

constraints also mean that the study design has to be cross-sectional, meaning that students were not repeatedly exposed to the material. Past successful studies on GMI and VAI tend to involve a recursive process (i.e., longitudinal study) held over more extended periods (e.g., Blackwell et al., 2007; Brougham & Kashubeck-West, 2017; Goyer et al., 2017; Hanselman et al., 2017; Paunesku et al., 2015). Still, it is worth noting that the attrition rate in recursive interventions tends to be fairly high, especially when administered online (Day et al., 2013). For example, an online-oriented self-help program designed by Day et al. (2013) reported that 56% of participants discontinued after a few phases of the intervention implementation. This trade-off should be considered in subsequent work that aims to extend our efforts.

Lastly, past GMI and VAI were integrated as a part of a specific subject, where students' evaluations of their internal process in learning are more contextualized (e.g., Bostwick & Becker-Blease, 2018; Rattan et al., 2012). Given that university courses and materials are delivered in different ways, contextualized interventions would allow students to better recognize the relevance of the content incorporated in our intervention and, therefore, apply it to learning specific course materials (Dowden, 2007; Johnson, 2001; Parr et al., 2008; Perkins & Salomon, 1989). Although we considered this matter before designing the intervention, in our case, course integration might require some alterations in the current practices within the course. Such an approach needs thorough planning, organizing, and coordination with university course coordinators, which reduces the feasibility of the implementation of the study considering our time constraints. Despite this, we encourage future interventions to consider an approach to integrate the intervention into a specific course.

## **Conclusion**

To conclude, SDL is a vital aspect of university education. It is viewed as both a goal of education and a process that leads to successful learning (Candy, 1991). The first phase of our study examined a proposed SDL model based on SDT and FTP theories, and in the second phase, we developed an intervention and tested its effectiveness based on the proposed SDL model. The study of SDL and its intervention need to continue, especially in a university context, where students are transitioning to adulthood and expected to be independent learners (Grolnick & Raftery-Helmer, 2015). Given the limitations discussed, there is a need for further exploration of the SDL construct and interventions that are sustainable and can be tailored easily to fit university pedagogy. As the proverb says, "give a man a fish, and you feed him for a day. Teach a man how to fish, and you feed him for a lifetime."

## References

- Al-Kumaim, N. H., Alhazmi, A. K., Mohammed, F., Gazem, N. A., Shabbir, M. S., & Fazea, Y. (2021). Exploring the Impact of the COVID-19 Pandemic on University Students' Learning Life: An Integrated Conceptual Motivational Model for Sustainable and Healthy Online Learning. *Sustainability*, *13*(5), 2546. <https://doi.org/10.3390/su13052546>
- Baldan Babayigit, B., & Guven, M. (2020). Self-Regulated Learning Skills of Undergraduate Students and the Role of Higher Education in Promoting Self-Regulation. *Eurasian Journal of Educational Research*, *20*(89), 1–24. <https://doi.org/10.14689/ejer.2020.89.3>
- Bakadorova, O., & Raufelder, D. (2017). The Interplay of Students' School Engagement, School Self-Concept and Motivational Relations during Adolescence. *Frontiers in Psychology*, *8*. <https://doi.org/10.3389/fpsyg.2017.02171>
- Bandura, A. (1985). *Social Foundations of Thought and Action* (1st ed.). Pearson Education (Us).
- Beard, K. S. (2014). Theoretically Speaking: An Interview with Mihaly Csikszentmihalyi on Flow Theory Development and Its Usefulness in Addressing Contemporary Challenges in Education. *Educational Psychology Review*, *27*(2), 353–364. <https://doi.org/10.1007/s10648-014-9291-1>
- Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit Theories of Intelligence Predict Achievement Across an Adolescent Transition: A Longitudinal Study and an Intervention. *Child Development*, *78*(1), 246–263. <https://doi.org/10.1111/j.1467-8624.2007.00995.x>
- Bostwick, K. C. P., & Becker-Blease, K. A. (2018). Quick, Easy Mindset Intervention Can Boost Academic Achievement in Large Introductory Psychology Classes. *Psychology*

- Learning & Teaching*, 17(2), 177–193.  
<https://doi.org/10.1177/1475725718766426>
- Boyer, S. L., Edmondson, D. R., Artis, A. B., & Fleming, D. (2013). Self-Directed Learning. *Journal of Marketing Education*, 36(1), 20–32.  
<https://doi.org/10.1177/0273475313494010>
- Brehm, S. S. (2013). *Psychological Reactance: A Theory of Freedom and Control*. Academic Press.
- Brougham, L., & Kashubeck-West, S. (2017). Impact of a Growth Mindset Intervention on Academic Performance of Students at Two Urban High Schools. *Professional School Counseling*, 21(1), 2156759X1876493. <https://doi.org/10.1177/2156759x18764934>
- Candy, P. C. (1991). *Self-Direction for Lifelong Learning: A Comprehensive Guide to Theory and Practice (Jossey Bass Higher & Adult Education Series)* (1st ed.). Jossey-Bass.
- Carvalho, E., & Skipper, Y. (2019). A two-component growth mindset intervention for young people with SEND. *Journal of Research in Special Educational Needs*, 20(3), 195–205.  
<https://doi.org/10.1111/1471-3802.12472>
- Cerasoli, C. P., Nicklin, J. M., & Nassrelgrawi, A. S. (2016). Performance, incentives, and needs for autonomy, competence, and relatedness: a meta-analysis. *Motivation and Emotion*, 40(6), 781–813. <https://doi.org/10.1007/s11031-016-9578-2>
- Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., van der Kaap-Deeder, J., Duriez, B., Lens, W., Matos, L., Mouratidis, A., Ryan, R. M., Sheldon, K. M., Soenens, B., van Petegem, S., & Verstuyf, J. (2014). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion*, 39(2), 216–236. <https://doi.org/10.1007/s11031-014-9450-1>

- Christensen, W. D., & Hooker, C. A. (2000). An interactivist-constructivist approach to intelligence: Self-directed anticipative learning. *Philosophical Psychology*, *13*(1), 5–45. <https://doi.org/10.1080/09515080050002717>
- Cohen, G. L., & Sherman, D. K. (2014). The Psychology of Change: Self-Affirmation and Social Psychological Intervention. *Annual Review of Psychology*, *65*(1), 333–371. <https://doi.org/10.1146/annurev-psych-010213-115137>
- Creswell, J. D., Dutcher, J. M., Klein, W. M. P., Harris, P. R., & Levine, J. M. (2013). Self-Affirmation Improves Problem-Solving under Stress. *PLoS ONE*, *8*(5), e62593. <https://doi.org/10.1371/journal.pone.0062593>
- Critcher, C. R., & Dunning, D. (2014). Self-Affirmations Provide a Broader Perspective on Self-Threat. *Personality and Social Psychology Bulletin*, *41*(1), 3–18. <https://doi.org/10.1177/0146167214554956>
- Day, V., McGrath, P. J., & Wojtowicz, M. (2013). Internet-based guided self-help for university students with anxiety, depression and stress: A randomized controlled clinical trial. *Behaviour Research and Therapy*, *51*(7), 344–351. <https://doi.org/10.1016/j.brat.2013.03.003>
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating Internalization: The Self-Determination Theory Perspective. *Journal of Personality*, *62*(1), 119–142. <https://doi.org/10.1111/j.1467-6494.1994.tb00797.x>
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating Internalization: The Self-Determination Theory Perspective. *Journal of Personality*, *62*(1), 119–142. <https://doi.org/10.1111/j.1467-6494.1994.tb00797.x>
- Dehnad, A., Afsharian, F., Hosseini, F., Arabshahi, S. K. S., & Bigdeli, S. (2014). Pursuing a Definition of Self-directed Learning in Literature from 2000–2012. *Procedia - Social*

*and Behavioral Sciences*, 116, 5184–5187.

<https://doi.org/10.1016/j.sbspro.2014.01.1097>

Dougherty, D., & Sharkey, J. (2017). Reconnecting Youth: Promoting emotional competence and social support to improve academic achievement. *Children and Youth Services Review*, 74, 28–34. <https://doi.org/10.1016/j.chilyouth.2017.01.021>

Dowden, T. (2007). Relevant, challenging, integrative and exploratory curriculum design: Perspectives from theory and practice for middle level schooling in Australia. *The Australian Educational Researcher*, 34(2), 51–71. <https://doi.org/10.1007/bf03216857>

Du Toit-Brits, C. (2018). Towards a transformative and holistic continuing self-directed learning theory. *South African Journal of Higher Education*, 32(4). <https://doi.org/10.20853/32-4-2434>

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*, 82(1), 405–432. <https://doi.org/10.1111/j.1467-8624.2010.01564.x>

Dweck, C. S. (2022). *Mindset : New Psychology Of Success*. Ballantine Books.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256–273. <https://doi.org/10.1037/0033-295x.95.2.256>

Easterbrook, M. J., Harris, P. R., & Sherman, D. K. (2021). Self-affirmation theory in educational contexts. *Journal of Social Issues*, 77(3), 683–701. <https://doi.org/10.1111/josi.12459>

Eschenbacher, S., & Fleming, T. (2020). Transformative dimensions of lifelong learning: Mezirow, Rorty and COVID-19. *International Review of Education*, 66(5–6), 657–672. <https://doi.org/10.1007/s11159-020-09859-6>

- Facer, K. (2019). Storytelling in troubled times: what is the role for educators in the deep crises of the 21st century? *Literacy*, 53(1), 3–13. <https://doi.org/10.1111/lit.12176>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149–1160. <https://doi.org/10.3758/brm.41.4.1149>
- Ferrer, R. A., & Cohen, G. L. (2018). Reconceptualizing Self-Affirmation With the Trigger and Channel Framework: Lessons From the Health Domain. *Personality and Social Psychology Review*, 23(3), 285–304. <https://doi.org/10.1177/1088868318797036>
- Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics*. SAGE Publications.
- Gourlay, L. (2015). ‘Student engagement’ and the tyranny of participation. *Teaching in Higher Education*, 20(4), 402–411. <https://doi.org/10.1080/13562517.2015.1020784>
- Greenberg, M. T., Weissberg, R. P., O’Brien, M. U., Zins, J. E., Fredericks, L., Resnik, H., & Elias, M. J. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist*, 58(6–7), 466–474. <https://doi.org/10.1037/0003-066x.58.6-7.466>
- Goyer, J. P., Garcia, J., Purdie-Vaughns, V., Binning, K. R., Cook, J. E., Reeves, S. L., Apfel, N., Taborsky-Barba, S., Sherman, D. K., & Cohen, G. L. (2017). Self-affirmation facilitates minority middle schoolers’ progress along college trajectories. *Proceedings of the National Academy of Sciences*, 114(29), 7594–7599. <https://doi.org/10.1073/pnas.1617923114>
- Grolnick, W. S., & Raftery-Helmer, J. N. (2015). Contexts supporting self-regulated learning at school transitions. *Self-Regulated Learning Interventions with at-Risk Youth: Enhancing Adaptability, Performance, and Well-Being.*, 251–276. <https://doi.org/10.1037/14641-012>

- Hanselman, P., Rozek, C. S., Grigg, J., & Borman, G. D. (2017). New evidence on self-affirmation effects and theorized sources of heterogeneity from large-scale replications. *Journal of Educational Psychology, 109*(3), 405–424. <https://doi.org/10.1037/edu0000141>
- Harter, S., & Pike, R. (1984). The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children. *Child Development, 55*(6), 1969. <https://doi.org/10.2307/1129772>
- Hill, J. R., Song, L., & West, R. E. (2009). Social Learning Theory and Web-Based Learning Environments: A Review of Research and Discussion of Implications. *American Journal of Distance Education, 23*(2), 88–103. <https://doi.org/10.1080/08923640902857713>
- Husman, J., & Lens, W. (1999). The role of the future in student motivation. *Educational Psychologist, 34*(2), 113–125. [https://doi.org/10.1207/s15326985ep3402\\_4](https://doi.org/10.1207/s15326985ep3402_4)
- Johnson, E. B. (2001). *Contextual Teaching and Learning: What It Is and Why It's Here to Stay* (1ste editie). Corwin.
- Johnson, R. T., & Johnson, R. T. (1999). *Learning Together and Alone*. Allyn and Bacon.
- Karatas, K., & Arpacı, I. (2021). The Role of Self-directed Learning, Metacognition, and 21st Century Skills Predicting the Readiness for Online Learning. *Contemporary Educational Technology, 13*(3), ep300. <https://doi.org/10.30935/cedtech/10786>
- Katz, I., & Assor, A. (2006). When Choice Motivates and When It Does Not. *Educational Psychology Review, 19*(4), 429–442. <https://doi.org/10.1007/s10648-006-9027-y>
- Klingsieck, K. B., Grund, A., Schmid, S., & Fries, S. (2013). Why Students Procrastinate: A Qualitative Approach. *Journal of College Student Development, 54*(4), 397–412. <https://doi.org/10.1353/csd.2013.0060>

- Kljajic, K., Schellenberg, B. J. I., & Gaudreau, P. (2022). Why Do Students Procrastinate More in Some Courses Than in Others and What Happens Next? Expanding the Multilevel Perspective on Procrastination. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.786249>
- Landau, M. J., Oyserman, D., Keefer, L. A., & Smith, G. C. (2014). The college journey and academic engagement: How metaphor use enhances identity-based motivation. *Journal of Personality and Social Psychology*, 106(5), 679–698. <https://doi.org/10.1037/a0036414>
- Lee, J., & Pant, M. (2020). Competency-based learning (CBL): Developing a competency-based geometry methods course. *The Journal of Competency-Based Education*, 5(4). <https://doi.org/10.1002/cbe2.1224>
- Leotti, L. A., Iyengar, S. S., & Ochsner, K. N. (2010). Born to choose: the origins and value of the need for control. *Trends in Cognitive Sciences*, 14(10), 457–463. <https://doi.org/10.1016/j.tics.2010.08.001>
- Legault, L. (2017). The Need for Competence. *Encyclopedia of Personality and Individual Differences*, 1–3. [https://doi.org/10.1007/978-3-319-28099-8\\_1123-1](https://doi.org/10.1007/978-3-319-28099-8_1123-1)
- Lent, R. W., & Brown, S. D. (1996). Social Cognitive Approach to Career Development: An Overview. *The Career Development Quarterly*, 44(4), 310–321. <https://doi.org/10.1002/j.2161-0045.1996.tb00448.x>
- Loeng, S. (2020). Self-Directed Learning: A Core Concept in Adult Education. *Education Research International*, 2020, 1–12. <https://doi.org/10.1155/2020/3816132>
- Lubbe, A. (2019). Participative assessment practices and its contribution to the development of self-directed learning skills. *NWU Self-Directed Learning Series*, 341–368. <https://doi.org/10.4102/aosis.2019.bk134.11>

- Mahlaba, S. (2020). Reasons why self-directed learning is important in South African during the COVID-19 pandemic. *South African Journal of Higher Education*, 34(6). <https://doi.org/10.20853/34-6-4192>
- Martin, A. J. (2008). Enhancing student motivation and engagement: The effects of a multidimensional intervention. *Contemporary Educational Psychology*, 33(2), 239–269. <https://doi.org/10.1016/j.cedpsych.2006.11.003>
- Meng, L., & Ma, Q. (2015). Live as we choose: The role of autonomy support in facilitating intrinsic motivation. *International Journal of Psychophysiology*, 98(3), 441–447. <https://doi.org/10.1016/j.ijpsycho.2015.08.009>
- Mentz, E., & van Zyl, S. (2018). The impact of cooperative learning on self-directed learning abilities in the computer applications technology class. *International Journal of Lifelong Education*, 37(4), 482–494. <https://doi.org/10.1080/02601370.2018.1513426>
- Merriam, S. B. (2022). *Learning in Adulthood: A Comprehensive Guide* (4th ed.). Jossey-Bass; 3 edition (2006–10-27).
- Mitchell, I. C., & A. . (2011). A typology of task characteristics and their effects on student engagement. *International Journal of Educational Research*, 50(5–6), 257–270.
- Miller, R. B., & Brickman, S. J. (2004). A Model of Future-Oriented Motivation and Self-Regulation. *Educational Psychology Review*, 16(1), 9–33. <https://doi.org/10.1023/b:edpr.0000012343.96370.39>
- Miyake, A., Kost-Smith, L. E., Finkelstein, N. D., Pollock, S. J., Cohen, G. L., & Ito, T. A. (2010). Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation. *Science*, 330(6008), 1234–1237. <https://doi.org/10.1126/science.1195996>

- Momani, R. T. (2017). Using Item Response Theory to Evaluate Self-directed Learning Readiness Scale. *Journal of Educational and Developmental Psychology*, 8(1), 14. <https://doi.org/10.5539/jedp.v8n1p14>
- Morris, T. H. (2019). Self-directed learning: A fundamental competence in a rapidly changing world. *International Review of Education*, 65(4), 633–653. <https://doi.org/10.1007/s11159-019-09793-2>
- Nation, M., Crusto, C., Wandersman, A., Kumpfer, K. L., Seybolt, D., Morrissey-Kane, E., & Davino, K. (2003). What works in prevention: Principles of effective prevention programs. *American Psychologist*, 58(6–7), 449–456. <https://doi.org/10.1037/0003-066x.58.6-7.449>
- Orsini, C., Binnie, V. I., & Wilson, S. L. (2016). Determinants and outcomes of motivation in health professions education: a systematic review based on self-determination theory. *Journal of Educational Evaluation for Health Professions*, 13, 19. <https://doi.org/10.3352/jeehp.2016.13.19>
- Parr, B., Edwards, C., & Leising, J. (2008). Does a Curriculum Integration Intervention to Improve the Mathematics Achievement of Students Diminish Their Acquisition of Technical Competence? An Experimental Study in Agricultural Mechanics. *Journal of Agricultural Education*, 49(1), 61–71. <https://doi.org/10.5032/jae.2008.01061>
- Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-Set Interventions Are a Scalable Treatment for Academic Underachievement. *Psychological Science*, 26(6), 784–793. <https://doi.org/10.1177/0956797615571017>
- Perkins, D., & Salomon, G. (1989). Are Cognitive Skills Context-Bound? *Educational Researcher*, 18(1), 16–25. <https://doi.org/10.3102/0013189x018001016>

- Pilling-Cormick, J., & Garrison, D. R. (2013). Self-Directed and Self-Regulated Learning: Conceptual Links. *Canadian Journal of University Continuing Education, 33*(2).  
<https://doi.org/10.21225/d5s01m>
- Rattan, A., Good, C., & Dweck, C. S. (2012). “It’s ok — Not everyone can be good at math”: Instructors with an entity theory comfort (and demotivate) students. *Journal of Experimental Social Psychology, 48*(3), 731–737.  
<https://doi.org/10.1016/j.jesp.2011.12.012>
- Robinson, J. D., & Persky, A. M. (2019). Developing Self-Directed Learners. *American Journal of Pharmaceutical Education, 84*(3), 847512.  
<https://doi.org/10.5688/ajpe847512>
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology, 25*(1), 54–67.  
<https://doi.org/10.1006/ceps.1999.1020>
- Saks, K., & Leijen, L. (2014). Distinguishing Self-directed and Self-regulated Learning and Measuring them in the E-learning Context. *Procedia - Social and Behavioral Sciences, 112*, 190–198. <https://doi.org/10.1016/j.sbspro.2014.01.1155>
- Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). Utrecht Work Engagement Scale-9. *PsycTESTS Dataset*. <https://doi.org/10.1037/t05561-000>
- Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology, 96*(4), 770–782. <https://doi.org/10.1037/a0014635>
- Sherman, D. K. (2013). Self-Affirmation: Understanding the Effects. *Social and Personality Psychology Compass, 7*(11), 834–845. <https://doi.org/10.1111/spc3.12072>

- Shteynberg, G., & Apfelbaum, E. P. (2013). The Power of Shared Experience. *Social Psychological and Personality Science*, 4(6), 738–744. <https://doi.org/10.1177/1948550613479807>
- Sirois, F., & Pychyl, T. (2013). Procrastination and the Priority of Short-Term Mood Regulation: Consequences for Future Self. *Social and Personality Psychology Compass*, 7(2), 115–127. <https://doi.org/10.1111/spc3.12011>
- Smale, B., & Fowlie, J. (2015). *How to Succeed at University*. SAGE Publications.
- Stolz, D. S., Müller-Pinzler, L., Krach, S., & Paulus, F. M. (2020). Internal control beliefs shape positive affect and associated neural dynamics during outcome valuation. *Nature Communications*, 11(1). <https://doi.org/10.1038/s41467-020-14800-4>
- Sun, W., Hong, J. C., Dong, Y., Huang, Y., & Fu, Q. (2022). Self-directed Learning Predicts Online Learning Engagement in Higher Education Mediated by Perceived Value of Knowing Learning Goals. *The Asia-Pacific Education Researcher*. <https://doi.org/10.1007/s40299-022-00653-6>
- Steele, C.M. (1988) The psychology of self-affirmation: Sustaining the integrity of the self. *Advances in Experimental Social Psychology*, 21(2), 261–302. [https://doi.org/10.1016/S0065-2601\(08\)60229-4](https://doi.org/10.1016/S0065-2601(08)60229-4)
- Tepper, R. J., & Yourstone, S. A. (2018). Beyond ACT & GPA: self-efficacy as a non-cognitive predictor of academic success. *International Journal of Accounting & Information Management*, 26(1), 171–186. <https://doi.org/10.1108/ijaim-05-2017-0060>
- Theobald, E. (2018). Students Are Rarely Independent: When, Why, and How to Use Random Effects in Discipline-Based Education Research. *CBE—Life Sciences Education*, 17(3), rm2. <https://doi.org/10.1187/cbe.17-12-0280>

- van der Walt, J. L. (2019). The Term “Self-Directed Learning”—Back to Knowles, or Another Way to Forge Ahead? *Journal of Research on Christian Education*, 28(1), 1–20.  
<https://doi.org/10.1080/10656219.2019.1593265>
- Veenman, M. V. J. (2011). Alternative assessment of strategy use with self-report instruments: a discussion. *Metacognition and Learning*, 6(2), 205–211.  
<https://doi.org/10.1007/s11409-011-9080-x>
- Wang, C., Liu, W. C., Kee, Y. H., & Chian, L. K. (2019). Competence, autonomy, and relatedness in the classroom: understanding students’ motivational processes using the self-determination theory. *Heliyon*, 5(7), e01983.  
<https://doi.org/10.1016/j.heliyon.2019.e01983>
- Wang, K. S., & Delgado, M. R. (2019). Corticostriatal Circuits Encode the Subjective Value of Perceived Control. *Cerebral Cortex*, 29(12), 5049–5060.  
<https://doi.org/10.1093/cercor/bhz045>
- Wang, M. T., & Eccles, J. S. (2011). Adolescent Behavioral, Emotional, and Cognitive Engagement Trajectories in School and Their Differential Relations to Educational Success. *Journal of Research on Adolescence*, 22(1), 31–39.  
<https://doi.org/10.1111/j.1532-7795.2011.00753.x>
- Wang, Y., Gao, H., Sun, C., Liu, J., & Fan, X. L. (2021). Academic procrastination in college students: The role of self-leadership. *Personality and Individual Differences*, 178, 110866. <https://doi.org/10.1016/j.paid.2021.110866>
- Weissberg, R. P., Kumpfer, K. L., & Seligman, M. E. P. (2003). Prevention that works for children and youth: An introduction. *American Psychologist*, 58(6–7), 425–432.  
<https://doi.org/10.1037/0003-066x.58.6-7.425>
- Yeager, D. S., Romero, C., Paunesku, D., Hulleman, C. S., Schneider, B., Hinojosa, C., Lee, H. Y., O’Brien, J., Flint, K., Roberts, A., Trott, J., Greene, D., Walton, G. M., & Dweck,

- C. S. (2016). Using design thinking to improve psychological interventions: The case of the growth mindset during the transition to high school. *Journal of Educational Psychology, 108*(3), 374–391. <https://doi.org/10.1037/edu0000098>
- Zander, L., Brouwer, J., Jansen, E., Crayen, C., & Hannover, B. (2018). Academic self-efficacy, growth mindsets, and university students' integration in academic and social support networks. *Learning and Individual Differences, 62*, 98–107. <https://doi.org/10.1016/j.lindif.2018.01.012>
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329–339. <https://doi.org/10.1037/0022-0663.81.3.329>

## Appendixes

### Appendix A: List of items for Study 1 Measures

	Items	Scale
Autonomy	I felt a sense of choice and freedom in the things I undertook in my studies (during past month)	Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS)
	I felt that my decisions regarding my studies reflect what I really wanted (during past month)	
Competence	I felt confident that I could do things related to my studies well (during past month)	
	I felt competent in what I was doing with regard to my studies (during past month)	
Relatedness	I felt connected to my fellow students (during past month)	
	I experienced a warm feeling with the fellow students and teachers I spend time with (during past month)	
Self-Directed Learning	When I study, I feel like I am bursting with energy. I find my studies to be full of meaning and purpose. Time flies when I'm studying. I feel strong and vigorous when I study and attend lectures. When I am studying, I forget everything else around me. My studies inspire me. When I get up in the morning, I feel like going to class or studying. I can get carried away by my studies.	Utrechtste Bevlogenheid Schaal (UBES-S-9)
Future Orientation	My study program prepares me well for a future career. I have a clear goal in mind regarding my future career I am confident that I will find a suitable job after my graduation	Self-constructed
Perceived Peer Support	To what extent do you experience social support from fellow students	Self-constructed
Perceived Teacher Support	To what extent do you experience social support from teachers	Self-constructed

## Appendix B: List of items for Study 2 Measures

	Items	Scale
Competence	<p>I think I have been doing well so far this study year.</p> <p>I think I have done well this year, compared to other students.</p> <p>After having studied at university for a while, I feel pretty competent.</p> <p>I am pretty skilled regarding the study material.</p>	<p style="text-align: center;">Intrinsic Motivation Inventory (IMI)</p>
	<p>I feel confident that I can complete my degree in the given time (e.g.: Bachelors degree in 3 years).</p> <p>I feel like I can respond to questions in lectures.</p> <p>I feel like I can meet my deadlines for my assignments.</p> <p>I feel like I can pay attention during every lecture.</p>	
Self-Directed Learning	<p>I have the intention to ask for help with my studies if needed.</p> <p>I have the intention to attend all my mandatory classes.</p> <p>I have the intention to attend all optional classes.</p> <p>I have the intention to try hard and do well in school.</p> <p>I have the intention to discuss the course materials with my friends.</p> <p>I have the intention to turn in my assignments on time.</p> <p>I have the intention to attend classes without completing the reading materials beforehand.</p> <p>I have the intention to engage in discussions during class.</p> <p>I have the intention to ask questions during class.</p> <p>I have the intention to answer questions asked by the teachers.</p> <p>I have the intention to be satisfied with my performance this year.</p> <p>I have the intention to watch extra study materials, such as knowledge clips, extra videos, etc.</p> <p>I have the intention to read the required literature for my courses.</p>	<p style="text-align: center;">Self-constructed</p>

## Appendix C: The Toolkit Intervention

### Unit 1: Prepare

Radboud University



To start with, let's reflect on our own self-study duration.

**How long (in minutes) do you normally study before taking a break?**

10    15    20    25    30    35    40    45    50    55    60

On average, I study \_\_\_ minutes before I take a break



What do you consider a good length to study?

**Between 20 and 45 minutes** is a good length.

The brain needs time to process all information received. It checks whether it recognizes the information, decides where it belongs precisely, in what order it should be placed, etc.

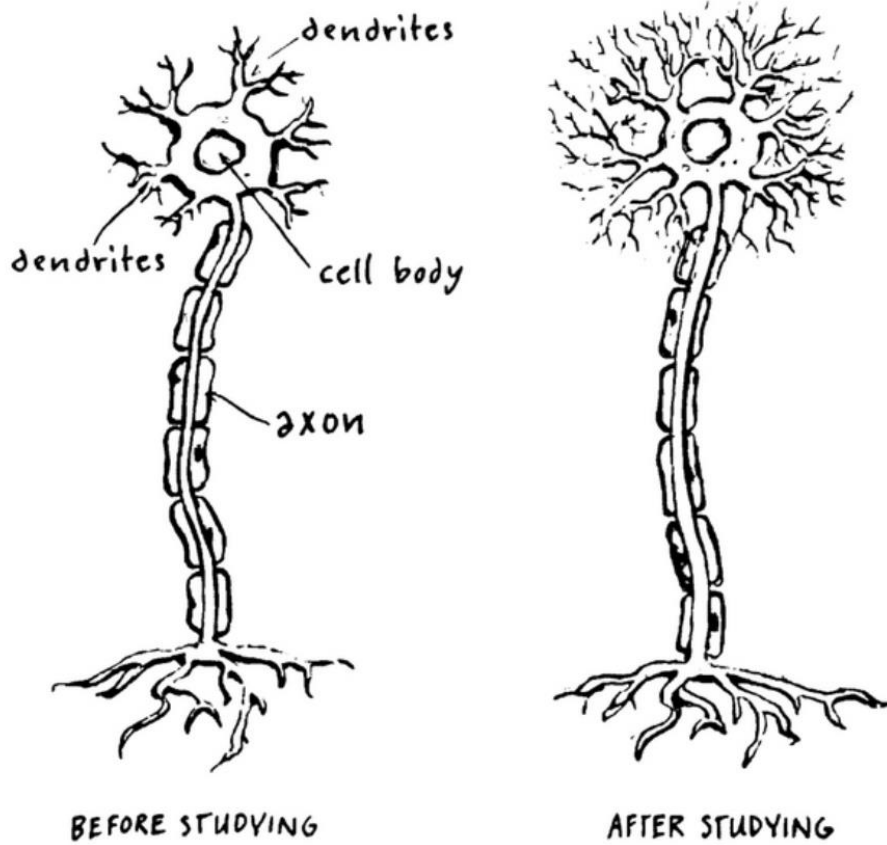
- If we do not study long enough, we don't thoroughly explore complicated matters.
- If we study for too long, our brain suffers an information overload. It can no longer process the incoming new information. This is the point we know we need to incorporate a short break!

**Tip: Let your brain catch its breath!**

Work in blocks of time. Take a short break once in a while. Afterward, your brain can actually process the incoming information better and faster!

Now, let's talk about the brain and learning.

When we **learn** something, we can see that being **reflected physically in our brain**. Nerve cells establish new networks and re-organize existing networks.



## Unit 2: Generate

Now, let's delve into a little bit of theory here.

Studies have found that if we are **motivated**, our brain produces **dopamine**. This is a chemical substance (*neurotransmitter*) that helps retain information. We use it to literally build better networks.

So, what does this mean? This means that it is smart to **work on our motivation!**

Motivation can flag when you are doing it for someone else, or if you have to wait too long for a 'reward'.

Your motivation concerns **what** you want, which reflects what you **value**. The more you really want something **for yourself**, the greater your motivation.

Therefore, when you are losing motivation to achieve something, it is helpful to reflect back on what you value and reaffirm what you find matters most in life.

Among all the values listed below, select **3** that you find **matter the most to you**:

- |  |                                  |                                      |
|--|----------------------------------|--------------------------------------|
| <input type="checkbox"/> Commitment      | <input type="checkbox"/> Honesty | <input type="checkbox"/> Inspiration |
| <input type="checkbox"/> Openness        | <input type="checkbox"/> Beauty  | <input type="checkbox"/> Faith       |
| <input type="checkbox"/> Personal Growth | <input type="checkbox"/> Love    | <input type="checkbox"/> Discipline  |
| <input type="checkbox"/> Respect         | <input type="checkbox"/> Justice |                                      |

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In a few sentences, write about **why** you chose those 3 values.

*Note: you can talk about a time in your life when these values were particularly important to you or when you had the opportunity to really express them.*

### Unit 3: Reflect

Now, let's move to the next topic: **Procrastination**

Which one(s) of these 10 statements relate to you most frequently?

*You can select more than one option.*

- "I just don't feel like studying now."
- "If I do it tomorrow, it will still be fine"
- "This topic is too complex, I lost the desire to learn it now."
- "Nobody tells me what to do and when to do it."
- "Hey, more than one thing is important in life, this assignment is not everything"
- "I have already covered this topic a few weeks ago, I think it will still be okay to revise it later."
- "My room is a little messy, let me just clean it up a little. I'll start studying after that."
- "It's funny, but every time I want to study something just seems to interrupt me."
- "I still have some time to complete this readings/homework, I'll do it another day."
- "Why all the fuss? Enjoy life. It will all turn out well"

### Unit 4: Closure

Now, below are 10 tips on how to procrastinate less.

Drag and drop each point to rank them from **1 (most feasible to be done to you)** to **10 (least feasible to be done to you)**:

- 1** Do half. Or a third. Or a quarter. Be nice to yourself. If you need to read 20 pages, then aim to do ten first.
- 2** Put up pictures of your loved ones or carry them with you. Sometimes friends, family, and/or partner(s) can be an inspiration to keep going.
- 3** Reward yourself regularly, even when finishing off smaller parts.
- 4** Remind yourself of your values, then think about if what you are doing now aligns with them.
- 5** Visualize yourself in a future time, for example, at graduation or starting a new job.
- 6** Divide the task or activity into smaller parts or pieces or use the POMODORO technique. Work in blocks of set duration. Reserve fixed periods in the week for studying. The more habits, rhythm, and regularity, the less space there is for 'negotiation'. Well-trodden paths are less easy to lose sign of.
- 7** Think of punishment, for example, "If I cannot finish this reading by today, I cannot go out tomorrow night"
- 8** Take some time to reflect back on how far you have gone. It motivates people when they think about how much closer they are each day to achieving their goals.
- 9** Make an appointment with a fellow student to study together and take a break once an hour. You will keep each other focused, and it is more fun!
- 10** Call up or talk to a friend/family member/partner and ask them to remind you of the importance to be resilient in your academic journey.

## Appendix C: Control Condition Task



In this part, you will be asked a number of questions about your experience as a student. There is no right or wrong answer, feel free to answer what you truly believe applies to you. You can also use bullet points.

In a few sentences, describe your **experience** at the university so far. Write down some suggestions, improvements, or changes you would like to see at the university.

*Note: this can be related to anything from your social life to your academics. You can also talk about your thoughts about the degree of "internationalness", or the inclusion of social groups, and the different identities in the university.*

Possibly, you have already experienced how it feels to **transition from on-campus education to online/virtual education**. In a few sentences, write about your personal experience - what and how this transition was like for you.

*Note: you can talk about some difficulties you have faced transitioning from on-campus to online education, or the other way around.*

Now, let's talk about your **study program**. Describe in a few statements **what** you think about it. Is there anything you would improve related to in-class settings?

*Note: you can talk about the flexibility in course choices, guidance or support from the faculty, and the general structure of them (electives, teachers, content, workload, etc).*