

From Planning to Prospering:

*Does coping planning impact the
Intention-Behavior Gap for academic
behavior through self-efficacy?*

Nadia de Jong

**University College Utrecht
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Abstract

Many individuals find it challenging to translate their intentions into behavior and are thus left with a discrepancy between their intentions and behavior. The present study examines this discrepancy with regards to the academic behavior of text comprehension and investigates the impact that coping planning strategies have on this gap. In a sample of 105 university students, intentions and behavior to comprehend a complex text were measured and subsequently analyzed. Participants were randomly assigned to one of two conditions: either the coping planning condition or the control condition. Those in the coping planning condition received a list of potential barriers and possible ways to overcome them before they began reading the text, whereas the control group did not receive these. The gap between intentions and behavior was significantly different between those who received coping planning strategies before reading the text, compared to those who did not. Contrary to the hypothesis however, self-efficacy did not mediate this relationship. Implications of the conclusions on educational teaching and ideas for future research are discussed.

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1. Introduction

Why do individuals fail to behave according to their academic intentions and more importantly, how can this failure be reduced? It is often assumed that in these cases of failure, although there is an intention to reach a goal, the individual fails to take pragmatic steps towards that goal because their intention simply was not strong enough. This would be in line with assumptions of the Theory of Planned Behavior (Ajzen, 1985), where strong intentions translate strongly into behavior. However, research shows that there may be other mechanisms at play in this so-called Intention-Behavior gap. A relevant construct examined within academic contexts is Bandura's (1997) well-known concept of self-efficacy, referring to the belief in one's capabilities to organize and execute courses of action required to attain goals. Having high self-efficacy has repeatedly been shown to improve the translation of intentions to behavior for various behaviors, particularly in the domain of health psychology (Araujo-Soares, McIntyre & Sniehotta, 2009; Schwarzer 1999; Schwarzer & Renner, 2000; Schwarzer, Luszczynska, Scholz & Ziegelmann, 2008; Sheeran, 2002; Sniehotta & Scholz & Schwarzer, 2005; Sniehotta & Scholz & Schwarzer & Shuz, 2005). For academic behavior at various ages, self-efficacy has proven to be a significant predictor of academic achievement, persistence and motivation (Bandura & Schunk, 1981; Khan, 2013; Pajares, 1996; Schunk & Ertmer, 1999; Schunk & Swartz, 1993; Zimmerman, 2005). Although self-efficacy is usually found to mediate the impact that strategies have on the Intention-Behavior gap (Gutierrez-Dona, Lippke, Renner, Kwon & Schwarzer, 2009), it has also been measured as an independent causal determinant of higher performance (Zimmerman, 2005). One strategy that has repeatedly been shown to decrease the Intention-Behavior gap is planning (Araujo-Soares et al., 2009; Gutierrez-Dona et al., 2009; Mullan, Wong, Allom & Pack, 2011; Reuter, Ziegelman, Wiedemann, Lippke, Schuz & Aiken, 2010; Wieber, von Suchodoletz, Heikamp, Trommsdorff & Gollwitzer, 2011; Wong & Mullan, 2009), with research also looking specifically at how this relationship is mediated (Schwarzer et al., 2008 & Sniehotta et al., 2005a) or moderated (Gutierrez-Dona et al., 2009) by self-efficacy. Although much literature has focused on planning (Gollwitzer, 1999; Sheeran, 2002; Sniehotta et al., 2005b), less emphasis has been placed on coping planning specifically, especially in the context of academic behavior. However, knowing that coping planning can be a powerful tool to decrease the Intention-Behavior gap for other behaviors can paint an optimistic picture about its influence on academic Intention-Behavior gaps. Using a sample of university students, this study explored the impact of coping planning strategies on Intention-Behavior gaps for academic behavior, and the mediating role of self-efficacy in this process. Intentions to comprehend a complex passage were measured, along with subsequent performance on a comprehension task. Analyses have been conducted by comparing participants in the

experimental condition who received coping strategies, with participants in the control condition who did not receive these. Knowing whether this process was mediated by self-efficacy and understanding the cognitive processes involved will provide more insight into how such planning can be administered for optimal results.

2. Literature Review

2.1. The Intention-Behavior Gap

2.1.1. What is the I-B Gap?

The intention-behavior gap (further referred to as the I-B gap) refers to the discrepancy between intentions and behavior. Some meta-analysis studies have shown that intentions explain only 28% of variance in behavior (Sheeran, 2002). Clearly, even when people have the intention to behave a certain way, in many cases the translation of these intentions into behavior may depend on other factors.

The primary model tying intentions to behavior is the theory of planned behavior, which defines intentions as how much effort people are willing to exert for a particular behavior (Ajzen, 1985). It assumes that intentions are predicted by perceived behavioral control, attitudes and subjective norms and in turn, intentions predict behavior. Therefore, people must perceive their control over performing the behavior to be able to act upon their intentions. Another assumption of the model is the stronger the intention, the more likely its translation to behavior is. This model has been supported through various studies, especially in the realm of health-related behaviors such as addiction prevention, cancer screening and oral hygiene (see Godin & Kok, 1996 for a review). On the other hand, a meta-analysis conducted by Sheeran (2002) showed that almost one half of the participants who intended to engage in different health behaviors such as exercise or condom use, failed to do so. Clearly, intentions do not predict behavior perfectly, thus leading to the I-B gap.

Others have also supported that intention formation and translation are two distinctly separate concepts, the former being more associated to action planning and the latter being more associated to action control (Rhodes, Plotnikoff & Courneya, 2008; Sniehotta et al., 2005a). Action planning involves specifying an intention in terms of the when, where and how, whereas action control involves translating that intention into actual behavior. In other words, saying you intend to do something is something different to actually doing it. For example, research shows that those who intend to be physically active are not necessarily successful at adopting this behavior, let alone maintaining it (Rhodes et al., 2008). Similarly,

a study conducted on job-seeking intentions and behavior in unemployed Dutch individuals showed that although the correlation between the intention and behavior to search for jobs was significant, this was only a weak correlation. However, unemployed individuals who intended to seek employment and made action plans about the when, where and how of implementation were much more likely to perform these activities (van Hooft, Born, Taxis, van der Flier & Blonk, 2005). Therefore, enacting upon goal intentions involves a primary phase of motivation development, and a secondary phase of volition where plans are made to ensure that this intention is translated into behavior (Gollwitzer, 1990; Heckhausen, 1991).

2.1.2. Factors influencing the I-B Gap

There are several reasons why the I-B gap exists and why this discrepancy might vary between studies. In some cases, these factors pertain to the constructs used to measure intentions and behaviors, while in other cases, cognitive and personality variables influence the presence and size of the I-B gap (see Sheeran, 2002 for a review).

Behavior Type

Correlations between intentions and behavior are impacted by what behavior is being examined. Firstly, intentions predict behavior best when the behavior is a single-action behavior rather than a goal behavior. For example, reading a textbook is a single-action behavior while getting an A for a course would be a goal behavior dependent on many single actions (Sheeran, 2002). Even in the domain of health psychology, various I-B correlations have been found for different behaviors such as cancer screening compared to cannabis use (Conner & McMillan, 1999; Montano & Taplin, 1991). While the cannabis use study (Conner & McMillan, 1999) found very high I-B correlations, the cancer screening study found only moderate I-B correlations (Montano & Taplin, 1991). The study by Conner & McMillan (1999) was a longitudinal study conducted on undergraduates in the form of an anonymous questionnaire. At the first round of study, respondents filled in their intentions to use cannabis in the next three months. Three months later, a follow-up questionnaire measured their self-reported cannabis use. Although self-reported results should be interpreted with caution (especially for a behavior that individuals do not openly discuss in public), they did find that correlations were high. An important factor to consider is that the intention and behavior in this study did not require a change in the individuals' behavior, and the constructs essentially measure how well the undergraduates could predict their behavior for something they already did. In the study examining cancer screening, Montana & Taplin (1991) used a questionnaire sent to women aged 40 and over about their intention to get a mammogram, and measured their actual participation in the screening program six months

later. Their results showed moderate correlations between behavior and intention, and contrary to their hypothesis, this was even lower when the women had previous mammography experiences prior to the questionnaire. A possible explanation for the difference between these correlations is that one behavior costs less effort than the other. In other words, it seems more likely to translate cannabis use intentions into cannabis use behavior than to translate intentions for cancer-screening into getting a mammogram, since the latter involves a more arduous process of behavior-change from individuals' habits.

It also seems logical to predict that intentions are less effective in predicting behaviors that require much effort to carry out. As Gollwitzer and Oettingen (1998) point out, health-related and disease-prevention behaviors, such as starting to exercise regularly and picking up a healthy diet, need an extra effort because there are immediate costs and only long-term rewards. Therefore, larger I-B gaps may be present for behavior types that require more effort expenditure.

Intention Type

Another factor influencing the I-B gap is the intention type, which includes how the intention is framed, the extent to which the consequences of the intention have been considered and how much the intention is based on moral norms.

The way an intention is framed will impact its translation to behavior, shown with evidence supporting the widely known concept of implementation intentions (Gollwitzer, 1999). Implementation intentions frame intentions in such a way that they not only indicate what behavior is intended, but also which situation (time and place) that behavior is intended for. These situational specifications develop contextual cues that elicit the behavior when appropriate, and essentially remind the individual of their intention when the cues are present. Extensive research has shown that by framing intentions using when and where details, participants are much more likely to behave according to their intentions for health behaviors (see Gollwitzer & Sheeran, 2006 for a review) as well as academic behaviors such as completing a work report on time (Gollwitzer, & Brandstätter, 1997).

It has also been shown that when the consequences of the intention have been well thought-out, intentions and behaviors are more consistent. This is referred to as the degree of intention formation, and also influences whether individuals will run into unforeseen obstacles that may change their intention (Sheeran, 2002). Those with well-formed intentions are able to anticipate potential barriers better and subsequently will continue to pursue their intention despite these obstacles. In Bagozzi & Yi's (1989) experiment on

readership behavior of marketing undergraduates, the degree of intention formation was manipulated by either giving participants the opportunity to consider the consequences of this act (well-formed intention group) or by giving them a distraction task (ill-formed intention group). Their results showed that intentions had a much stronger effect on behavior when intentions were well-formed rather than ill-formed. Clearly, having considered the possible consequences of an intention helps to create intentions that will translate more strongly to behavior.

Thirdly, the I-B gap is also reduced when intentions stem from personal beliefs rather than from expected feedback of significant others. Research supports that intentions based on personal moral norms translate better into behavior because these intentions activate central values and direct attention to the self (Godin, Conner & Sheeran, 2005). This contrasts to intentions based on attitudes, which depend more on a cost/benefit analysis of the behavior. This was investigated in undergraduates for different health behaviors such as smoking, exercise and driving under the speed limit. Using two questionnaires measuring intention, perceived morality of the behavior, moral norm and behavior, they showed that intentions based on internalized notions of right and wrong are stronger predictors of health behavior than intentions based on attitudes.

Personality Characteristics and Cognitive Factors

Lastly, personality variables and cognitive factors, such as action versus state-orientation and degree of confidence, can also influence the I-B gap (Sheeran, 2002). State-orientated and action-orientated refer to personality aspects, in which the former personality type constructs their intentions on the basis of normative expectations, and the latter bases them on attitudinal considerations (Kuhl, 1985). Furthermore, state-oriented personalities have lower self-regulation capacities and are generally more passive than those with action-oriented personalities. Although most research has failed to show that this trait moderates the influence of intentions on behavior (Bagozzi, Yi & Baumgartner, 1992; van Hooft et al., 2005), their results showed that state-orientated individuals were more likely to translate their intentions to behavior, although only when these behaviors were under normative control (Norman, Sheeran & Orbell, 2003). These researchers used a longitudinal survey measuring intentions and state versus action orientation at Time 1 and behavior at Time 2 for 30 behaviors including attending lectures and eating a piece of fruit every day. Two weeks later, they measured whether they had actually translated their intentions into actions. Results showed that state-oriented individuals were more likely to act according to intentions for behaviors under normative control, such as avoiding smoking cigarettes and going home

to visit parents. This shows that certain personality traits can impact the I-B gap, despite only applying to specific kinds of behavior.

Pieters and Verplanken (1995) investigated confidence variables in their study about voting intentions and actual voting behavior. They looked at the moderating role of reasoning and degree of confidence in the intention. Supporting the aforementioned research about degree of intention formation (Bagozzi & Yi, 1989), they showed that when participants were more confident that they would actually vote for a certain party and when they had put much thought and reasoning into their intention, they were more likely to vote according to their previous voting intention. However, the most relevant cognitive factor, as will be elaborated upon later, is self-efficacy (see section 2.3.1).

2.1.3. Intention Strength and the I-B Gap

As Gollwitzer and Sheeran (2006) state in their research article on implementation intentions and goal achievement, “holding a strong goal intention does not guarantee goal achievement, because many people struggle with self-regulatory problems during goal striving” (p.1). Contrary to this, Ajzen’s (1991) Theory of Planned Behavior supports that the subjective probability of a behavior is based on the strength of each salient belief. Although not entirely the same construct as intention strength, temporal stability is a construct defined as the extent to which an attitude persists over time regardless of whether it is challenged (Krosnick & Petty, 1995). Temporal stability has been shown to be a defining feature of intention strength (Sheeran, Orbell & Trafimow, 1999). In an experiment about physical activity behavior, stability of intention was investigated with regards to the I-B gap (Sheeran & Abraham, 2003). As they assume that stability is a key indicator of intention strength, this was predicted to mediate other moderators on the I-B gap such as past behavior, anticipated regret, and attitudinal versus normative control. Stability was measured mainly by a within-participants correlation of participant intentions at Time 1 and Time 2 (separated by two weeks). Behavior was measured using two self-reported items concerning physical activity in the past two weeks. Their findings illustrate that for the undergraduate sample they examined, intention stability does indeed moderate the effect of other moderators of the I-B gap.

Sheeran, Orbell, & Trafimow (1999) also investigated this in a more academic context, regarding study behavior in the winter vacation among undergraduates. Participants answered two questionnaires: once at the beginning of their winter break and once six weeks later at the end of their break. Questionnaires at Time 1 measured constructs such as

intentions, attitudes and perceived behavioral control. Self-reported study behavior was measured at Time 2. Their results support the findings by Sheeran and Abraham (2003) that temporal stability moderates the relationships of variables such as past behavior on the I-B gap. They also found that when intentions of studying over the winter vacation were weak, stability of intention did not matter a great deal. This finding shows that stability and strength may not be entirely similar constructs after all. Intention stability moderates the effect of strong intentions on behavior, so that when intentions are both stable and strong, they are most likely to be enacted upon.

2.1.4. Summary

As research shows, intentions do not always translate into behavior and there are many factors that impact this gap. Firstly, when the behavior type is specific and easy, it is easier to carry intentions through than if they are general and effortful. Secondly, intention types specifying the when, how and where of behavior are more likely to be translated. Moreover, intentions for which the consequences have been considered, and intentions that stem from moral beliefs are also more likely to result in behavior. Finally, having an action-orientated personality and being confident in the intention will also lead more to behavior.

2.2. Coping planning

2.2.1. What is Coping Planning?

As one of the first to differentiate between action and coping planning, Sniehotta et al. (2005a) describe coping planning as a barrier focused self regulation strategy that mentally connects anticipated risks with the strategies to cope with them. Studies about exercise adherence behavior have induced this by for example, getting participants to indicate how they would respond to high-risk situations such as fatigue or negative mood (Simkin & Gross, 1994). Most research on coping planning in the health domain manipulates this by getting participants to come up with strategies themselves rather than providing them with a list of barriers and strategies, since “individuals are the best experts of their own weaknesses and strengths once they experience themselves in the domain of interest” (Sniehotta et al., 2005a). Furthermore, by cognitively linking potential obstacles for goal achievement to suitable ways that one can cope with these obstacles, coping planning can protect action plans from falling through. It is thus essential for mainly the maintenance of a behavior after it is translated from an intention. Despite their structural similarity, the main difference between action and coping planning is that action planning is task-facilitating,

whereas coping planning is distraction-inhibiting, with the distraction being anything that distracts the individual from their primary goal (Sniehotta et al., 2005a). It is also important to recognize that coping planning is often rooted in experience, since it is difficult to anticipate and overcome barriers without experience that determines what those barriers may be. In such cases, coping planning requires knowledge about one's personal risk situations (such as distractions or temptations) that may act as a barrier to goal attainment. Sniehotta et al. (2005a) argue that this knowledge must come from experience to be effective.

2.2.2. Coping Planning and Performance

Executive functioning, defined as the ability to engage in higher order cortical functions, has been shown to play an important role in the I-B gap (Lehto, Juujärvi, Kooistra & Pulkkinen, 2003). In a correlational study by Mullan et al. (2011), these skills moderated the effect of intentions on behavior for binge drinking among university students. They administered four tests of self-regulation associated to different executive functions. An example includes the Stroop task, which tests inhibition control. The time it takes a participant to name the ink color of a word printed in an incongruent color is compared with the time the participant takes to name the color when the word color is neutral. Those with a smaller difference score have higher planning ability than those with a larger difference score. Using measures such as these, they found that high planning ability and high inhibition control correlated to carrying through with intentions not to binge drink. Binge drinkers planned for a shorter time, made more risky decisions than non-binge drinkers and did not succeed to convert their intentions into behavior. Clearly, higher planning ability and inhibition control can be useful to minimize the I-B gap for certain health behaviors.

In their longitudinal study on determinants of physical activity in adolescents, several researches measured coping and planning using the Action and Coping Planning scales in a survey, along with intentions, self-efficacy and behavior at three time periods across five months (Araujo-Soares et al., 2009). Adolescents who combined action and coping planning had the highest increase in health behavior, emphasizing the need for what-when-how action goals in combination with the anticipation of barriers and knowing how to overcome them.

On the other hand, coping planning has also been applied in academic settings. In Zimmerman et al.'s (1996) instructional model book for teaching essential study skills to middle- and high-school students, several coping strategies are mentioned pertaining to reading comprehension. They outline the importance of teaching such strategies to improve

children's understanding of complex texts, although they stress that strategies will differ in effectiveness depending on contextual and individual factors. It is thus also important to keep in mind that no strategy is universally effective and no strategy is always appropriate. Examples of the strategies given to students included, "finding the main idea", "relating it to prior knowledge" and "rereading the text when the meaning was unclear". The authors also highlight the importance of strategic-outcome monitoring, since the effectiveness of strategies can differ for individuals. In an experimental setting in which participants are provided with coping strategies, this could be done by measuring how useful the strategies were for the goal the participants were aiming to achieve.

It has also been shown that if-then planning can help young children ignore attractive distractions (Wieber et al., 2011). A sample of 49 children (Mean age=6 years) were first administered a personality characteristics measure. Then the children were instructed to categorize vehicles while they were (1) not presented distracting stimuli, or (2) presented distracting stimuli of low attractiveness, or (3) presented distracting stimuli of medium attractiveness, or (4) presented distracting stimuli of high attractiveness. The stimuli were presented on the upper half of the screen, clearly within the child's sight. Following this, the same task was administered but the distracting stimuli were placed on a separate television that was out of the child's sight. Children were randomly assigned to conditions where they were told how to ignore the distractions. This varied from simply shielding the goal intention using the phrase "ignore the distractions" to an implementation intention such as "if there is a distraction, then I will ignore it". Results show that children in the implementation intentions condition looked at the out-of-sight distraction for a shorter period of time than those with a shielding goal intention and they also had slower response times when the distraction was attractive for the in-sight distraction. This shows that especially for attractive distractions, coping planning in the form of implementation intentions can help to translate distraction-inhibiting intentions into behavior. Even though this was tested in very young individuals, and the implementation intention they used did not strongly specify the how, when and where of the response, results still contribute to an overall understanding about the effectiveness of planning for distraction inhibition.

As mentioned previously, implementation intentions specify the what, when and how of an intended behavior, and when intentions are framed in this way, this can have significant effects on the I-B gap. Implementation intentions foster mental imagery and increase cognitive access to situational cues and appropriate behavioral responses (Gollwitzer, 1999; Fennis, Adriaanse, Stroebe & Pol, 2011). Much evidence supports the effectiveness of

implementation intentions for a variety of behaviors (see Gollwitzer & Sheeran, 2006 for a review).

According to Gollwitzer (1999), successful goal pursuit also requires shielding the ongoing goal pursuit from distractions, conflicting goals and habits. Coping planning implementation intentions are specifically tailored against distractions or habits and can be in the form of task-facilitating or distraction-inhibiting intentions. The former aims to convert the effort to ignore the distraction into putting in more effort to the task at hand, while the latter concentrates purely on ignoring the distraction and thus requires less effort. They are greatly mediated by the strength of intention, since intentions can result in “over-motivation” when an already high intention is increased further by a task facilitating intention. This causes the implementation intention to work in a backfiring manner. This highlights the importance of strength of motivation and intention before implementing certain intentions. It is of further interest whether this strength of intention also backfires for other strategies such as coping planning.

According to Gollwitzer and Oettingen (1998), coping planning helps to deal with distractions that derail the primary goal. It is perhaps also by keeping the primary goal focal that planning can help goal achievement. As mentioned previously, coping planning must specify the when, where and how of the behavioral steps required to overcome barriers. In a similar fashion, Schwarzer (2008) defines action plans as proximal constructs that remind us of our intentions.

Reuter et al. (2009) examined how planning reduces the I-B gap for physical activity for young and middle-aged railway employees. Their longitudinal study measured planning by combining both action and coping planning into one measure. Planning at Time 1 was moderately correlated to physical activity at Time 1 ($r=.44$, $n=265$, $p<0.01$) and physical activity at Time 2 ($r=.35$, $n=265$, $p<0.01$). Planning at Time 2 was also correlated to physical activity at Time 2 ($r=.45$, $n=265$, $p<0.01$). Their model shows that when employees planned to exercise and planned how to cope with exercise barriers, this predicted 28% of the variance in physical activity.

In another study about health behavior, Wong and Mullan (2009) showed that planning ability moderated the I-B gap for breakfast consumption. Participants were administered measures of executive functioning including planning and response inhibition and then completed self-reported questionnaires about their breakfast consumption. Intentions were shown to significantly predict breakfast consumption, and planning ability moderated the

association between intentions and behavior, meaning that those who were good at planning also had smaller I-B gaps. These examples show that planning can help reduce the I-B gap, at least for certain health behaviors.

2.2.3. Planning and Intention Strength

Gollwitzer and Oettingen (1998) argue the importance of strong intentions to enhance the translation from intention to behavior through volitional planning. The effect of an implementation intention is only as strong as the intention in forming the plan and implementation intentions that are based on weak intentions will not be effective (Gollwitzer, 1999). Schwarzer et al. (2008) also support the idea that planning and high recovery self-efficacy help translate intentions to behavior for those who already have an intention and are therefore already in the volitional phase.

Wiedemann et al. (2009) researched the role of intention strength with regards to physical activity and dental hygiene behavior in two studies. Their first longitudinal study was among individuals staying at a cardiac rehabilitation center (Mean age=60.3 years). Their study consisted of Time 1, where patients answered questions about intentions, action planning and socio-demographic variables and Time 2 (four months later), where physical activity was assessed using self-reported measures. Intention strength was measured using four-point Likert scales for intention statements that participants agreed or disagreed with. An example is "I intend to be physically active in the several times per week". Action planning involved four items testing how well the participants had developed action plans that specified the when, where, how and how often details about their plans to exercise. They hypothesized that mediation of intention on action planning would be particularly strong for people with high intentions to engage in health behavior but not for those with low intentions (moderated mediation). High intentions were categorized as one standard deviation above the mean, whereas low intentions were categorized by one standard deviation below the mean. Their results confirmed that action planning mediated the effect of intentions on physical activity more strongly at high levels of intentions than low intentions. In their second study, they used a similar research procedure to test interdental hygiene behavior among individuals recruited at dental practices (Mean age=45.1 years). Results also supported that the indirect effect of intentions on behavior increased with levels of the moderator (intention strength). Although self-reported measures may be limited in their validity, this research still provides strong evidence for the moderating role of intention strength on the effect of planning on the

I-B gap. A gap in the research still remains, however, for similar research for coping planning specifically.

2.2.4. Summary

Coping planning, as a self-regulation strategy that cognitively connects anticipated risks and coping strategies, has been shown to decrease the I-B gap for different behaviors, although most of these behaviors are health-related. Both high planning ability and “if-then” planning have been correlated to smaller I-B gaps, especially when intentions are phrased as implementation intentions. Moreover, intention strength has been shown to moderate the impact of planning on the I-B gap, although not coping planning specifically. This leads to the hypothesis that coping planning will also impact the I-B gap for academic behavior. Most research has manipulated coping planning by instructing participants to devise their own barriers and strategies, or by measuring the extent to which participants have considered the possible barriers and ways to overcome them. In the academic context there may be less variation in the types of barriers that may be encountered and the subsequent coping strategies. Hence, this research will induce coping planning through a more direct manner by providing participants with a list of potential barriers and possible coping strategies to overcome them, before they engage in the behavior.

2.3. Self-Efficacy

2.3.1. Self-Efficacy and Performance

Self-efficacy includes beliefs in one’s capabilities to organize and execute courses of action that are required to attain goals. This definition means that one with high self-efficacy knows, or at least perceives that they know, what it takes to reach their goal (Bandura, 1997).

In Pajares’ (1996) summary of self-efficacy in academic settings, self-efficacy has been shown to impact academic performance, task choice, effort expenditure, perseverance, thought patterns and emotional reactions. In addition, self-efficacy often mediates the influence of other determinants on academic performance.

In the domain of health behavior, successful adopters of physical activity can also be distinguished from unsuccessful adopters by self-efficacy. Levels of self-efficacy discriminated successful adopters from unsuccessful adopters in that those with high self-efficacy were more likely to adopt exercise behavior (Rhodes, 2008). This shows the importance of self-efficacy in adopting and maintaining a behavior.

However, is it certain that self-efficacy *causes* a better performance? Correlational results leave room for the possibility that those who perform better will have higher self-efficacy because they are aware of their high ability, reflected in their better performance. In addition, by rating their own self-efficacy, students may become more aware of the role that judgments of capability can have on their efforts (Zimmerman et al., 1996). The causal role of self-efficacy in mathematical problem solving performance has been investigated by Pajares and Miller (1994). In a sample of undergraduates, they first measured math self-efficacy, math self-concept, perceived usefulness of mathematics and math anxiety in the form of a survey. Shortly after, they administered a Mathematics Problems Performance Scale to assess their mathematical performance. Their results not only showed that self-efficacy had the strongest direct effect on performance, but also that the link was causal, as was indicated by their path analyses. As many studies investigate the mediating role of self-efficacy in the link between knowledge and action, there is room to believe that it similarly mediates the relationship between intention and behavior in a similar manner.

2.3.2. Self-Efficacy and Persistence

Having a higher self-efficacy also results in accrediting successes to personal capabilities and failures to insufficient effort, thus leading to more motivation to excel in future tasks by expending more effort (Weiner, 1985). This also leads to more persistence when facing failure. On the other hand, low self-efficacy leads to the opposite effect: attributing successes to situational factors and failures to deficiency in ability, which is accompanied by lower persistence when encountering difficulties or failure.

In their meta-analysis, Bandura and Zimmerman (2010) also support that high self-efficacy results in higher resistance to failure and more persistence on a task, especially when behaviors are difficult and require much effort. Furthermore, in an experiment investigating persistence and self-efficacy, Schunk (1981) found that children who judged their capabilities of understanding math problems higher, subsequently had higher persistence, measured by the time they spent on the math problems. Those children also succeeded more than the low self-efficacy children. In addition, path analyses of causality indicated that self-efficacy directly influenced their skill acquisition in the math problems, as well as indirectly through persistence.

2.3.3. Increasing Self-Efficacy

Schunk and Ertmer (1999) showed that frequent self-evaluation when coupled with a process or product goal leads to higher self-efficacy. A process goal refers to a goal that involves techniques and strategies that can be used for a student to learn or acquire skills, whereas a product goal focuses more on the rate or quantity of work or tasks that can be completed. Their two studies examined the combined effect of goals and self-evaluation on self-efficacy, achievement and competence in undergraduates acquiring computer skills. In another study by Schunk and Swartz (1993), it was shown that goal setting and progress feedback improved self-efficacy for writing tasks in a sample of fourth graders. The children given a process goal pertaining to learning a writing strategy, in combination with feedback on their progress, possessed a higher self-efficacy and writing performance compared to children who received a general or product goal. These results show that a writing strategy instruction can increase self-efficacy and writing performance even more when it is combined with a process goal. This connects to the idea that planning may be a type of process goal that could increase both self-efficacy and performance.

Another strategy shown to increase self-efficacy is proximal goal setting, which fosters correct self-knowledge shown in accurate levels of self-efficacy. In Bandura and Schunk's (1981) study on disinterested young math students, they showed that unmotivated math students were stimulated by proximal goals to gain truthful self-knowledge about their capabilities. In turn, these students subsequently performed better in mathematical problems. The different conditions were manipulated by giving either proximal, distal or no goals to the unmotivated math students and then measured mathematic self-efficacy on a 100-point rating scale. The proximal goal manipulation involved suggesting students to split up the homework pages per week, while the distal goal simply suggested students to complete all pages before a certain deadline. Results showed that in the proximal goal condition, children's mathematical self-efficacy increased as well as their mathematical performance. However, their self-efficacy did not significantly increase with a distal goal or with no goals. This shows that inducing individuals to set specific goals in the near future can result in increases in both self-efficacy and performance.

2.3.4. Coping Planning and Self-Efficacy

It seems logical that knowing how to deal with anticipated barriers gives individuals a higher feeling of perceived capability to complete the task. In a longitudinal study on cardiac

rehabilitation patients, Sniehotta et al. (2005b) showed that maintenance self-efficacy moderately correlated and moderately predicted action planning, meaning that those with high self-efficacy were also more likely to plan to initiate their behavior. Maintenance self-efficacy refers to the perceived ability of coping with unexpected barriers and therefore successfully maintaining a behavior, whereas action planning involves forming specific intentions to reach the goal. In addition, action planning moderately predicted how likely patients were to self-regulate by self-monitoring, acting according to their exercising standards and exerting effort. This shows that those with high self-efficacy were not only more likely to plan to start the behavior, but also to maintain it through action planning.

In a study about physical exercise adherence in cardiac rehabilitation patients, behavior was examined in relation to action planning and recovery self-efficacy (Schwarzer et al., 2008). Results showed that across a one-year time span, action planning and recovery self-efficacy were effective predictors of adhering to physical exercise. This means that those who created action plans and those who believed that they could recover from setbacks were more likely to have smaller I-B gaps. Furthermore, high levels of self-efficacy corresponded to external attributions of failure, resulting in a higher recovery self-efficacy and optimism about ability to control damage. In other words, self-reported planning mediates the relationship between intentions and behavior.

Gutierrez-Dona et al. (2009) investigated the impact of dietary coping planning on converting dietary intentions into behaviors, and the role of self-efficacy in this relationship. In their first study they surveyed women taking part in a health program about their dietary planning intentions, how mentally prepared they were to deal with barriers, their perceived self-efficacy in overcoming barriers and their self-reported dietary behavior. A limitation to consider, however, is that coping planning was measured with only one item asking how much they agreed with the statement "I already have concrete plans for what to do in difficult situations in order to stick to my intentions", rather than also making them specifically answer which barriers there would be and how they would overcome them. Coping planning mediated the effect of intentions on dietary behavior only when self-efficacy was reported as higher than 2.82, on a 4-point scale (with four being the highest level of self-efficacy), showing that self-efficacy moderates the impact of coping planning on the I-B gap. In a second longitudinal study, they administered questionnaires across a period of six months measuring self-efficacy, coping planning and dietary behavior. These results replicated the findings in the first study by showing that planning helped to translate intentions into behavior but not among those with very low levels of self-efficacy (below a value of 2.82).

Coping planning may also reduce the I-B gap because it reminds individuals constantly of the goals they have set, something that has been shown to be a very important aspect of motivation and achievement (Pajares & Schunk, 2001). The effectiveness of goal setting lies in their proximity, specificity and difficulty. Mini-goals such as implementation intentions are effective because they specify the what, how and where of the goal achievement (Gollwitzer, 1999). It has been shown that those who set specific and proximal goals also report higher perceptions of self-efficacy and superior achievement compared to those that do not (Zimmerman & Kitsantas, 2005). Evidently, when an individual becomes aware of the type and amount of effort required to achieve a goal, their self-efficacy increases. Similarly, it has been shown that successful goal attainment impacts future goal setting and motivation differently depending on the level of self-efficacy. In the face of success, high self-efficacy levels tend to show higher future goal setting and motivation, whereas those who have doubts about achieving their goals will lower their goals and be less motivated (Pajares & Schunk, 2001).

2.3.5. Summary

Self-efficacy, as one's belief of being capable to organize and execute courses of action that are required to attain goals, has been shown to influence a multitude of motivational and performance factors through mediation, moderation or direct causation, depending on the context. In both health and academic behaviors, self-efficacy has been linked to smaller I-B gaps and persistence in the presence of failures. Strategies shown to increase self-efficacy involve frequent self-evaluation, goal formation and proximal goal setting. Although coping planning has not explicitly been used as a strategy to increase self-efficacy, it has been shown that self-efficacy and planning are often correlated, and that the former can predict the latter. Some studies also show that a combination of both planning and self-efficacy result in the smallest I-B gap.

This research leads to the hypothesis that the impact of coping planning on the I-B gap will be mediated by self-efficacy. Although mediation and causal roles of self-efficacy have also been discussed, most literature confirms the mediation role. Coping planning is hypothesized to impact self-efficacy, as participants in this condition will be informed about the courses of action necessary to attain their goals. Furthermore, differing levels of self-efficacy will in turn lead to varying levels of performance and I-B gaps between the condition and the control group.

2.4. The Present Study

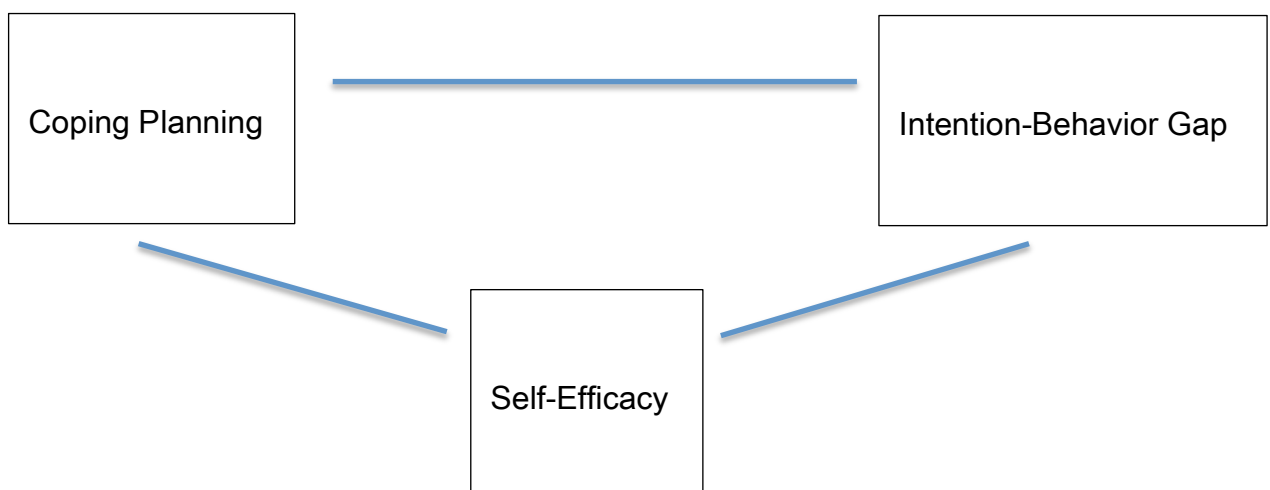
As various research shows, the I-B gap is evident for a range of different behaviors, especially in the case of specific, effortful behavior coupled to general and attitudinally motivated intentions. Coping planning, as a strategy proven to effectively reduce this gap especially in health behavior, holds much potential to also reduce this gap in an academic context. Research on self-efficacy posits that if such strategies can increase self-efficacy for academic tasks, this can have important implications for subsequently reducing the I-B gap.

This study will examine the impact of coping planning in the academic context, pertaining to the behavior of comprehending a complex passage. In order to better understand the underlying processes supporting this strategy, the mediating role of self-efficacy will also be examined. By looking at discrepancies between intention to comprehend and actual comprehension, an I-B gap will be determined for different participants. The impact of coping strategies on this I-B gap will be measured by administering a list of barriers and possible coping strategies to participants assigned to a coping planning condition, while a control group does not receive these strategies.

It is hypothesized that those who receive coping planning strategies before attempting to comprehend a text will have a statistically different average I-B gap than those who do not receive these strategies. Furthermore, this effect of coping planning on the I-B gap is hypothesized to be mediated by self-efficacy (see Figure 1).

Figure 1.

Conceptual model with integrated hypothesis, showing that coping planning impacts the I-B gap, mediated by self-efficacy



3. Method

3.1. Participants

105 university students (30 males, 75 females, $M_{age} = 20.31$ years, age range: 18-24 years) from University College Utrecht were recruited with flyers that invited participants to engage in a study on English proficiency (see Table I for a summary of demographics). They were compensated five euros for their participation in the experiment. There were eight additional participants, recruited on a voluntary basis, who provided pilot suggestions for coping strategies (See Appendix B for a summary). Of the total sample, 5% of participants indicated they had basic English proficiency, 27% indicated they had good English proficiency and 69% indicated they had very good English proficiency. Furthermore, only one percent had heard about biochar previous to the experiment, and subsequently claimed to be somewhat knowledgeable about it. For this reason, it was not believed that previous knowledge should be controlled for in the analysis.

3.2. Procedure

The intention and behavior were framed with regards to the comprehension of a complex passage about biochar, a recent discovery claimed to have significant potential for climate change mitigation. Participants were invited to a computer lab, where they completed an online survey that was part of a larger research group investigating negative feedback and goal-orientation. The cover story presented on the flyers pertained to an experiment testing English language proficiency, as to avoid socially desirable answers. Participants were randomly assigned to one of two conditions: the coping planning condition or the control condition. Upon arriving, participants signed a consent form (see Appendix A) and subsequently began the survey by answering questions about demographics, English proficiency and previous knowledge about biochar. Then measures of intention strength and self-efficacy were administered, after which the manipulation group received coping strategies for the possible barriers they would face, and the control group did not receive anything. The coping strategies included a list of four potential barriers that would interfere with attempts to comprehend the passage and the possible ways in which participants could cope with these. Following this, they were given a hard copy of the passage about biochar and its potential for climate change mitigation. Again, participants reported their self-efficacy. Participants were then instructed to fill out a multiple-choice exam to test their comprehension of the passage, along with a point scheme for how their multiple choice answers would contribute to their total score. Due to a technical error, the first six

participants were not given this scheme. Nevertheless, it was decided to include these participants in the analyses because their scores were not outliers to the rest of the data. Moreover, it was assumed that this factor would not have a significant impact on the results. After completing the exam, participants in the coping planning condition were asked how useful the coping barriers were for their comprehension. Following this, all participants completed persistence measures, and lastly, they were debriefed.

3.3. Materials

Comprehension behavior. Participants were given a maximum of ten minutes and a minimum of five minutes to read a complex passage about biochar (see Appendix B) with a similar layout to a complex textbook passage with key words in bold and a definitions table for difficult terminology. A countdown timer was visible on the computer screen so that participants were aware of how much time remained. The exam about the passage consisted of ten multiple-choice questions for which participants were told that they would be given one point for each correct answer, one minus point for each incorrect answer and nothing for each answer left blank. Pilot studies (Appendix C) indicated that the exam was sufficiently difficult ($M_{\text{score}} = 5/10$).

Intentions. Intentions were measured using one item that asked participants how strongly they agreed with the statement “I intend to comprehend the passage about biochar” (ranging from 1=*strongly disagree* to 7=*strongly agree*), as used in previous research.

Self-Efficacy. Self-efficacy was measured using one item asking participants to what extent they believe that they are capable of understanding this passage about biochar (ranging from 1=*very strongly believe I am unable* to 6=*very strongly believe I am able*). This measure was taken after participants received the coping manipulation and had read the passage. Possible answers ranged from 1-6 so that participants would have no neutral option (neither disagree nor agree), as this would likely have been favored by many and would have been challenging to analyze.

Coping Planning. The coping barriers sheet was designed using responses from the pilot studies as well as research on different comprehension strategies used for popular exams such as the GMAT (Adler, 2001; Shaheen, 2015; Zimmerman et al., 1996). Participants in the coping planning condition were shown a list of four possible barriers and coping strategies that they could encounter while trying to understand the passage (Appendix D). The control group did not receive strategies and directly moved on to the reading passage.

Additional Variables

The following variables were measured but do not pertain to the main hypotheses tested.

Usefulness of Coping Strategies

For those in the coping planning condition, the reported usefulness of the coping strategies manipulation were also measured after the multiple-choice exam with a measure asking participants how useful the provided coping strategies were for the comprehension of the text (ranging from 1=*extremely useful* to 5=*not useful at all*). Possible answers were on a 5-point scale rather than the typical 7-point scale, as this measure was intended more to check if the manipulation was effective rather than to use in analysis. It was thus kept as brief as possible.

Persistence. Persistence was measured by asking participants if they wanted to participate in a future excursion to a biochar farm to learn more about biochar and its benefits. They were instructed to fill in their e-mail addresses in the case that they were interested, and thus wanted to persist in learning about biochar.

Confidence. A confidence measure was taken by asking participants whether they wanted an easy and factual or difficult and conceptual version of the exam, although they were given the same exam regardless of their choice.

Exam Duration. The amount of time that participants used to complete the exam was also recorded in seconds. This recorded how much time participants needed between beginning the exam and submitting the exam.

4. Results

4.1. Hypotheses Tested

Analyses began by generating descriptives and frequencies for the different variables measured (see Table 1). Several analyses were conducted to investigate whether coping planning had an impact on I-B gap for text comprehension (Hypothesis 1) and whether self-efficacy mediated this impact (Hypothesis 2). Frequencies for intentions showed that a high percentage of participants agreed with the intention statement (60%), followed by strongly agreed (20%), somewhat agree (16.2%), and neither disagree nor disagree and somewhat disagree (1.9%, combined). This shows that almost all participants had high intentions, which is also supported by the low standard deviation of 0.78.

Table 1.

Mean, minimum, maximum and standard deviation scores for the different measures

Measure	N	Minimum	Maximum	Mean	Standard Deviation
Comprehension	105	-6	6	0.76	2.78
Intentions	105	3	7	5.94	0.78
Self-efficacy	105	1	6	4.12	1.05
Usefulness of Coping Strategies	53	1	4	2.91	0.74
Persistence	105	0	1	.57	.50
Confidence	105	0	1	.42	.50
Exam Duration (seconds)	105	87.17	585.34	278.89	100.50

Note. Persistence and confidence were coded so that 0=not persistent and 1=persistent for persistence, and 0=easy and 1=difficult for confidence.

To begin with, a composite variable for I-B gap was created using intention and behavior z-scores. These standardized scores were used to jointly analyze two variables that could otherwise only be analyzed separately. The gap between behavior and intention was calculated by subtracting intention z-scores from behavior z-scores (i.e. comprehension – intentions = I-B gap). This composite measure for I-B gap indicates the difference between intentions and behavior, where scores approaching zero refer to a small I-B gap and scores moving further from zero refer to a larger I-B gap (Table 2). Moreover, a high I-B gap score indicates better comprehension than the participant intended for, and a low I-B score indicates that they intended to comprehend more than they actually did. As this measure is based on z-scores, a zero mean value for I-B gap would indicate that this participant had a relatively similar score for both intention and comprehension behavior, although this does not discriminate between high behavior-high intention and low behavior-low intention participants.

Table 2.

Descriptives for the composite I-B gap variable

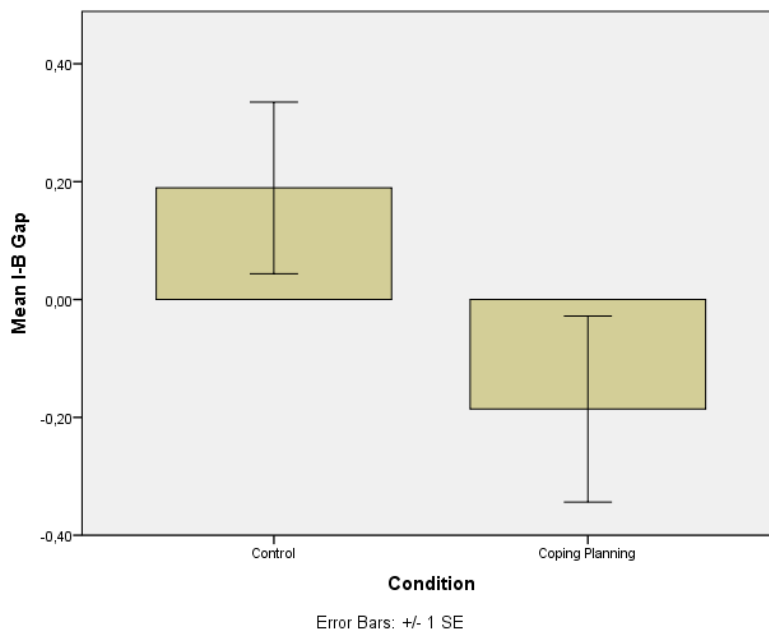
	N	Minimum	Maximum	Mean	Standard Deviation
I-B Gap	105	-2,72	2,93	,0000	1,11236

Coping Planning and the I-B Gap

After all assumptions were met, an independent-samples t-test was conducted to compare the I-B gaps for those in the coping planning condition and those in the control condition. As shown in Figure 2, there was a marginal significant difference in I-B gaps between those in the control condition (M=.19, SD=1.05) and those in the coping planning condition (M=-.19, SD=1.15); $t(103)=1.75$, $p=0.84$, with those in the coping planning condition having more negative I-B gaps than the control condition, meaning that their intention scores were relatively larger than their behavior scores. However, this only holds at a 90% confidence interval, rather than the standard 95% interval that is most commonly used. The magnitude of the difference in means (mean difference=.38, 95% CI: 0.02 to 0.73) was between small to medium (Cohen's $d=.34$).

Figure 2.

Comparison of I-B gap in the control and coping planning condition



Furthermore, a one way analysis of covariance was used to determine whether self-reported usefulness of the strategies would moderate this impact. Usefulness of coping strategies for

those in the coping planning condition was categorized under very useless (n= 2), somewhat useless (n=11), somewhat useful (n=13) and very useful (n=10). Results show that there were no significant differences on the impact of the condition on I-B gap for different levels of self-reported usefulness, $F(1,52) = 0.012$, $p = .914$.

Mediating role of self-efficacy

To investigate whether self-efficacy mediated this impact of the coping planning condition on I-B gap, two paths were analyzed. Firstly, the impact of the coping planning on self-efficacy was analyzed and following this, the impact of self-efficacy on I-B gap was examined.

To begin with, the link between coping planning and self-efficacy is described. Despite meeting all other assumptions for this test, the assumption of a normally distributed dependent variable was violated. Considering the large sample size ($n > 30$), analyses were carried out despite this violation. An independent-samples t-test was conducted to compare self-efficacy for those in the coping planning condition and those in the control condition. There was no significant difference in self-efficacy between those in the control condition ($M = 4.12$, $SD = 0.96$) and those in the coping planning condition ($M = 4.13$, $SD = 1.14$); $t(103) = -0.08$, $p = .936$. This disproved the first part of the second hypothesis.

Next, the impact of self-efficacy on I-B gap was investigated. After meeting all assumptions, a one-way ANOVA was conducted to determine if I-B gaps were different for participants with different self-efficacy levels. Participants were classified into six groups based on their response on the self-efficacy measure: high self-efficacy (n=12), moderately high self-efficacy (n=21), somewhat high self-efficacy (n=47), somewhat low self-efficacy (n=19), moderately low self-efficacy (n=5) and low self-efficacy (n=1). There was no significant difference between groups as determined by the one-way ANOVA, $F(5,104) = .969$, $p = .440$. This disproved the second part of the second hypothesis, and allows it to be rejected.

Coping Planning and Additional Variables

Although not included in the formulated hypotheses, the impact of coping planning on additional variables such as persistence, confidence, and exam duration, was also considered. A Chi-square test of independence was calculated comparing persistence in coping planning and control conditions. No significant interaction was found, $X^2(1) = .26$, $p = .61$. Therefore, those in the coping planning condition were not more likely to persist than those in the control condition.

The same Chi-square test of independence was calculated comparing confidence in coping planning and control conditions. No significant interaction was found, $\chi^2(1)=1.6$, $p=.20$. Therefore, those in the coping planning condition were not more likely to express a confident result than those in the control condition.

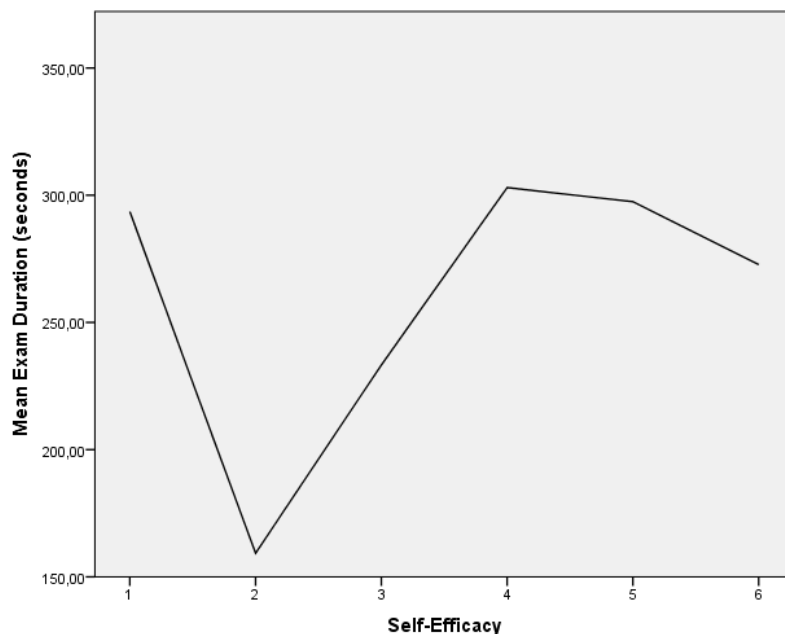
Next, the impact of the coping planning condition on exam duration was examined. After all assumptions were met, an independent-samples t-test was conducted to compare exam duration for those in the coping planning condition and those in the control condition. There was only a marginally significant difference in exam duration between those in the control condition ($M=284$, $SD=107$) and those in the coping planning condition ($M=274$, $SD=95$); $t(103)=-0.53$, $p=.60$. However, this only holds at a 90% confidence interval.

Self-Efficacy and Additional Variables

Analyses on the impact of self-efficacy on the same additional variables as above were also conducted. However, for both confidence and persistence variables, a Chi-squared test could not be administered because more than 20% of the expected counts were less than five.

Figure 3.

Mean exam duration for different self-efficacy groups



Nevertheless, a one-way ANOVA was conducted to determine if exam duration was different for individuals with different self-efficacy levels. As previously explained, participants were classified into six groups based on their response on the self-efficacy measure: high self-

efficacy (n=12), moderately high self-efficacy (n=21), somewhat high self-efficacy (n=47), somewhat low self-efficacy (n=19), moderately low self-efficacy (n=5) and low self-efficacy (n=1). There was a significant difference between groups as determined by the one-way ANOVA, $F(5,104)=3.20, p=.010$. As shown in Figure 3, there is a clear difference of exam duration depending on self-efficacy, although this is not necessarily a linear trend.

5. Discussion

5.1. Main Findings

This study aimed to test the impact of coping planning strategies on the I-B gap for text comprehension. Moreover, the mediating role of self-efficacy in this relationship was also examined. Results marginally support the first hypothesis that coping planning strategies impact the I-B gap, which confirm the existing findings (Lehto et al., 2003; Zimmerman et al., 1996). As mentioned, there was a marginal significant difference in I-B gaps between those in the control condition and those in the coping planning condition. Moreover, the average scores for I-B gap between the two conditions also show that the average I-B gap in the coping planning condition was lower than the average for the control condition. In Figure 2 it can be seen that the coping planning condition had a more negative I-B gap than the control condition. Since the I-B measure is a difference score between behavior and intentions z-scores, this finding indicates that those in the coping planning condition had, on average, higher intentions than behavior compared to the control group. Furthermore, when testing if this relationship was somewhat influenced by the usefulness of the strategies, an insignificant result was found. Self-reported usefulness of the strategies has no significant impact, possibly because participants were not able to reflect on these strategies correctly.

It seems contradicting that those who received coping planning strategies had higher intentions than behavior in comparison to those in the control condition, although there are some possible explanations for this. First, the coping strategies may have caused participants to attend too much of their attention to the strategies to overcome potential barriers, even to the point that they were distracted from the comprehension of the text itself. Moreover, the list of potential barriers may have made the participants feel threatened or pressured by increasing the perceived difficulty of the text, leading to less certainty when completing the comprehension task. Finally, by acknowledging that potential barriers could be faced, this may have led to a self-fulfilling prophecy in which the prediction of something causes itself to come true (Azariadis, 1981).

The second hypothesis, concerning the mediation of self-efficacy in the relationship between coping planning and I-B gap, was rejected. This contradicts much research conducted on these constructs (Schwarzer et al., 2008; Sniehotta et al., 2005b). Analyses indicated that coping planning did not impact self-efficacy, nor did self-efficacy impact comprehension behavior. This could be due to the low variance in the self-efficacy scores, shown by the relatively low standard deviation ($SD=1.05$). Another possible explanation is that self-efficacy moderated the relationship rather than mediated it, although this would be difficult to test considering the low variance.

Additional analyses indicated that the impact of coping planning strategies on other variables such as persistence, confidence and exam duration were not significant, which was contrasting to findings by Bandura and Zimmerman (2010), and Schunk (1981). The same applies for the impact of self-efficacy on these variables, with the exception of exam duration, which was significantly linked to different levels of self-efficacy. This could be because the amount of effort exerted on a task is greatly impacted by self-efficacy, and the duration spent completing an exam is an optimal measure of how much effort one is willing to expend (Weiner, 1985). As shown in Figure 3, there seems to be a trend that the higher participant self-efficacy is, the longer they spend on the exam, although there are some exceptions. Moreover, exam duration, as opposed to persistence and confidence, may also have been a more visible measure to other participants in the experiment. It could be that self-efficacy results in participants expending more effort on the task, under the condition that their effort is visible to others. On the other hand, it could also have been that those with the lowest level of self-efficacy (see Figure 3) were less confident with their answers, and thus took more time to make decisions.

A possible reason for the insignificant results and weak effect size related to coping planning may be that the effect of this manipulation was simply was not strong enough to impact the various measures. This could be due to the relatively brief nature of the manipulation, which only involved a short list of coping strategies. Another explanation for the weak effect of coping planning strategies is that the barriers and coping strategies were not suitable for the participants. Although these strategies were derived from pilot studies and nearly 80% of participants reported them as either somewhat useful or useful, not every coping plan is equally suited to an individual or a group of individuals. In addition, this design assumes that those in the control condition did not consider potential barriers and coping strategies while reading the text.

5.2. Limitations

As mentioned previously, the coping planning manipulation may have resulted in insignificant differences because it was relatively brief and may not equally have been relevant for all the participants. Perhaps stimulating participants to come up with their own strategies and potential barriers may have been more engaging and perhaps more effective for the manipulation. On the other hand, it would have been difficult to control this for coping planning ability and the amount of effort exerted. Furthermore, although the usefulness of the coping strategies as a whole was measured, this allowed no differentiation between the usefulness of each separate strategy. Further research could examine specific coping strategies and potential barriers to determine which of these is most effective for specific personalities, goal-orientations, behaviors, and so on.

Secondly, the intention and behavior were framed with regards to text comprehension, which may be a more complex behavior than the behaviors for which coping planning has been shown to stimulate. Whereas following a diet seems like a relatively simple behavior that one can either execute or not, comprehension also requires specific cognitive skills and a certain level of competence that some people simply may not possess and that coping planning will unlikely induce. This may make it a more complex behavior to study than typical health behaviors discussed in the coping planning literature. In addition, comprehension was measured by the answers that participants gave on the multiple-choice exam, which involved specific detail recollection from the text. It may therefore be that the comprehension measure was examining the amount that participants remembered rather than the amount participants comprehended.

Another limitation lies with the relatively low variances for self-efficacy and intentions. This could be due to the sample size per condition, although other measures on the same sample managed to have much higher variances. The Likert-scale nature of these constructs also allowed participants to indicate relatively neutral responses, especially since they were not very opinionated on these measures. Although a topic was chosen for the text that was expected to be more appealing to some than others (for example, more of interest to environmentally-friendly individuals), comprehension behavior may not have enough significance to individuals. Although it would have been possible to broaden these scales in an attempt to create more variance, this still runs the risk that all participants answer questions neutrally. A more optimal way to overcome this is by manipulating these constructs rather than simply measuring them. For example, to ensure varying levels of self-efficacy, students could have been given a range of different complex texts discussing either

a familiar or unfamiliar topic. It would be expected that they would show varying levels of self-efficacy based on this familiarity. Intention strength could have been manipulated by perhaps giving several participants either a reward or punishment based on their performance. Therefore, manipulating these variables rather than simply measuring them may be a successful way to overcome this limitation.

Another limitation with these findings is that they fail to indicate which condition was associated to a smaller I-B gap (closest to zero). This would have provided valuable knowledge about the direction of the impact of coping planning on the I-B gap. Most research on the I-B gap is more concerned with having higher intentions than behavior, rather than lower intentions than behavior, since higher behavior is often the desired outcome. Following this, it is presumably better to have a positive I-B gap score, because this is at least associated to strong behavior. On the other hand, the findings showed that those in the coping condition generally had lower behavior than intentions, compared to the control group. However, these findings are based on the assumption that an I-B gap is exclusively the difference between intentions and behavior. This undermines that low intentions could predict high behavior, or that high intentions could predict low behavior. In other words, it is still possible for the two variables to impact one another without them necessarily being the same.

Finally, coping planning has been shown to work especially well in the maintenance phase of behavior change, so perhaps it is less effective to measure I-B gaps pertaining to the comprehension of a new passage and thus new behavior. Further research would be needed to examine its effect on various academic behaviors, both novel and familiar, to see for which cases it holds the most potential. Similarly, the longitudinal impacts of coping planning were also not addressed in this research, while this may provide valuable insights on the mechanisms underlying prosperous coping planning.

5.3. Implications

The implication that coping planning marginally impacts academic I-B gaps is of great significance in the realm of educational psychology. Such strategies can easily be taught to university students to facilitate the translation of academic goals to reality. However, more research is needed to determine which strategies are most helpful in reducing the I-B gap, along with the cognitive mechanisms underlying the process of coping planning and the academic behaviors it is most suited for.

Moreover, the mediating hypothesis of self-efficacy in this relationship was rejected, indicating that self-efficacy perhaps may not be the “holy grail” of academic performance and persistence. On the other hand, self-efficacy did have a significant impact on exam duration, showing that it may be more relevant in determining the effort exerted, rather than performance. The finding that self-reported usefulness of coping planning did not moderate the impact of coping planning on the I-B gap also shows that students may be unaware of the potential of certain strategies. Therefore, it seems that strategies such as coping planning can be effective without being perceived by the individual to be effective.

In conclusion, I-B gaps are prevalent for many behaviors and discovering ways in which these gaps can be reduced will facilitate individuals to achieve their goals in the most optimal ways. As this research shows, simple strategies such as coping planning strategies can have significant impacts on this gap. These findings enhance our understanding of the potential of this strategy for academic intentions and behavior, and lead the way for future research to further explore the concepts addressed.

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Appendices.

Appendix A: Consent Form

As part of our degree at University College Utrecht we are conducting a research study in psychology. As a participant in this study, you will be asked to read a short text, write a short essay, and complete a small test. This experiment should take approximately 30 to 40 minutes to finish.

In order to participate in this research study, it is necessary that you provide informed consent. By signing this consent statement you agree that you understand the nature of the research study and your role in that research, and that you agree to participate in the research. Please consider the following points before signing:

- I understand that participation in this study is voluntary and I am not obliged to participate.
- I understand that I will be participating in psychological research.
- I understand that I am free to withdraw from the experiment without any penalties at any given time.
- The collected data will be seen by the course supervisor and colleagues in the form of a research paper. All data will be presented so that anonymity is maintained.
- I understand that certain aspects of the study may be withheld from me. At the end of the experiment, debriefing and discussion will be provided concerning the conclusions of the study and any experiences from this experiment that I would like to talk about.

By signing this form I am stating that I understand all of the above information and consent to participate in this study being conducted at Utrecht University/University College Utrecht.

Name: _____

Signature: _____

Today's Date: _____

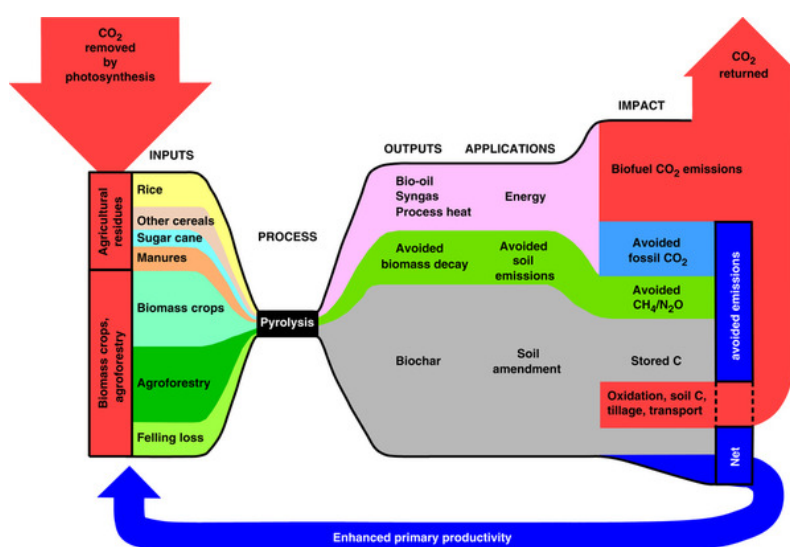
Appendix B: Biochar Passage and Exam

Sustainable biochar to mitigate global climate change

Since 2000, anthropogenic carbon dioxide emissions have risen by more than 3% annually, putting Earth's ecosystems on a trajectory towards rapid climate change that is both dangerous and irreversible. Several studies have shown that, to stabilize global mean surface temperature, cumulative anthropogenic GHG emissions must be kept below a maximum upper limit, thus indicating that future net anthropogenic emissions must approach zero. If humanity oversteps this **threshold of maximum safe cumulative emissions** (a limit that may already have been exceeded), no amount of emissions reduction will return the climate to within safe bounds. **Mitigation** strategies that draw down excess CO₂ from the atmosphere would then assume an importance greater than an equivalent reduction in emissions.

Production of biochar, in combination with its storage in soils, has been suggested as one possible means of reducing the atmospheric CO₂ concentration. Biochar's climate-mitigation potential stems primarily from its highly **recalcitrant** nature, which slows the rate at which **photosynthetically fixed carbon** is returned to the atmosphere. In addition, biochar yields several potential co-benefits. It is a source of renewable bioenergy; it can improve agricultural productivity, particularly in low-fertility and degraded soils where it can be especially useful to the world's poorest farmers; it reduces the losses of nutrients and agricultural chemicals in run-off; it can improve the water-holding capacity of soils; and it is producible from **biomass** waste. Of the possible strategies to remove CO₂ from the atmosphere, biochar is notable, if not unique, in this regard.

Biochar can be produced at scales ranging from large industrial facilities down to the individual farm, and even at the domestic level, making it applicable to a variety of socioeconomic situations. Various **pyrolysis** technologies are commercially available that yield different proportions of biochar and bioenergy products, such as **bio-oil** and **syngas**. Pyrolysis processes are classified into two major types, fast and slow, which refer to the speed at which the biomass is altered. Fast pyrolysis, with **biomass residence times** of a few seconds at most, generates more bio-oil and less biochar than slow pyrolysis, for which biomass residence times can range from hours to days.



The sustainable-biochar concept is summarized in Figure 1. CO₂ is removed from the atmosphere by photosynthesis. Sustainably obtained crop residues, manures, biomass crops, timber and forestry residues, and green waste are pyrolysed by modern technology to yield bio-oil, syngas, process heat and biochar. As a result of pyrolysis, immediate decay of these biomass inputs is avoided. The outputs of the pyrolysis process serve to

provide energy, avoid emissions of GHGs such as CH₄ and N₂O, and amend agricultural soils and pastures. The bioenergy is used to **offset** fossil-fuel emissions, while returning about half of the C fixed by photosynthesis to the atmosphere. In addition to the GHG

emissions avoided by preventing decay of biomass inputs, soil emissions of GHGs are also decreased by biochar amendment to soils. The biochar stores carbon in a recalcitrant form that can increase soil water- and nutrient-holding capacities, which typically result in increased plant growth. This enhanced productivity is a **positive feedback** that further enhances the amount of CO₂ removed from the atmosphere. Slow decay of biochar in soils, together with **tillage** and transport activities, also returns a small amount of CO₂ to the atmosphere.

The figure shows inputs, process, outputs, applications and impacts on global climate. Within each of these categories, the relative proportions of the components are approximated by the height/width of the coloured fields. CO₂ is removed from the atmosphere by photosynthesis to yield biomass. A sustainable fraction of the total biomass produced each year, such as agricultural residues, biomass crops and agroforestry products, is converted by pyrolysis to yield bio-oil, syngas and process heat, together with a solid product, biochar, which is a recalcitrant form of carbon and suitable as a **soil amendment**. The bio-oil and syngas are subsequently **combusted** to yield energy and CO₂. This energy and the process heat are used to offset fossil carbon emissions, whereas the biochar stores carbon for a significantly longer period than would have occurred if the original biomass had been left to decay. In addition to fossil energy offsets and carbon storage, some emissions of methane and nitrous oxide are avoided by preventing biomass decay and by amending soils with biochar. Additionally, the removal of CO₂ by photosynthesis is enhanced by biochar amendments to previously infertile soils, thereby providing a positive feedback. CO₂ is returned to the atmosphere directly through combustion of bio-oil and syngas, through the slow decay of biochar in soils, and through the use of machinery to transport biomass to the pyrolysis facility, to transport biochar from the same facility to its disposal site and to incorporate biochar into the soil. In contrast to bioenergy, in which all CO₂ that is fixed in the biomass by photosynthesis is returned to the atmosphere quickly as fossil carbon emissions are offset, biochar has the potential for even greater impact on climate through its enhancement of the productivity of infertile soils and its effects on soil GHG **fluxes**.

Abbreviations

- CO₂= carbon dioxide
- GHG= greenhouse gas
- CH₄ = methane
- N₂O = nitrous oxide

Difficult Terminology

Threshold of maximum safe cumulative emissions	the point to which carbon emissions do not pose a threat to safety by warming the earth's temperature
Mitigation	the action of reducing the severity or seriousness of something
Recalcitrant	Resistant to decomposition e.g. The carbon in biochar is recalcitrant against decomposition and thus remains in the soil for centuries longer
Photosynthetic	involving a process used by organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities.
Photosynthetically fixed carbon	carbon that has been converted from CO ₂ in the atmosphere to organic compounds through the process of photosynthesis by living organisms

Biomass	biological material derived from living or recently living organisms
Pyrolysis	a form of treatment that chemically decomposes organic materials by heat in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 430 degrees celsius
Bio-oil	Bio-oil can be used as a replacement for numerous applications where fuel oil is used
Syngas	a synthetic gas used as a fuel gas mixture
Biomass residence times	how long biomass remains in the process of pyrolysis
offset	to cancel out or counteract something
Positive feedback	a process whereby the initial effects of a small change in the system result in an even bigger effect
Tillage	the preparation of land for growing crops
Soil amendment	any material added to a soil to improve its physical properties
Combusted	to be consumed or destroyed by fire
Fluxes	the combined processes of in and out flows

Text adapted (Woolf et al., 2010).

Multiple Choice Exam Questions

Note. Correct answers are underlined

1. Which of the following processes occurs last in the stages of biochar production described in the text?

- A) Pyrolysis
- B) Photosynthesis
- C) Oxidation
- D) Returning of CO₂ to the atmosphere
- E) Uncertain

2. Which of the following was not mentioned as a benefit of biochar in the text

- A) Improves agricultural productivity
- B) Improves water-holding capacity of soils
- C) Improves the nutritional quality of agricultural products
- D) Reduces losses in nutrients and agricultural chemicals from run-off
- E) Uncertain

3. Which of the following sentences about biochar production is MOST FALSE?

- A) Biochar stores carbon for a longer period of time than the original biomass it was made from
- B) Because of the energy needed for the pyrolysis of biomass, biochar is better to produce on an industrial rather than small scale

- C) Depending on what type of pyrolysis is performed, biomass is converted into varying quantities of bio-oil, syngas and biochar
- D) Biochar can reduce emissions by storing carbon in a more stable way and by increasing the productivity of the soil
- E) Uncertain

4. Which type of pyrolysis generates the most biochar in comparison to bio-oil?

- A) Fast pyrolysis
- B) Slow pyrolysis
- C) Both generate around the same amount of biochar
- D) This was not mentioned in the passage
- E) Uncertain

5. Which of the following is NOT one of the ways in which biochar production mitigates rapid climate change?

- A) Offsets fossil energy through the use of bio-oils
- B) Uses positive feedback by removing more atmospheric CO₂ through photosynthesis
- C) Stores carbon for a longer period of time than fossil fuels
- D) Avoids methane and nitrous oxide emissions from plant decomposition
- E) Uncertain

6. Which of the following statements about biochar is MOST FALSE?

- A) Biochar's recalcitrant nature results in less CO₂ being absorbed from the atmosphere
- B) Biochar allows for a more stable form of carbon holding
- C) Biochar slows down the rate at which photosynthetically fixed carbon returns to the atmosphere
- D) The recalcitrant form of carbon in biochar allows for increased plant productivity
- E) Uncertain

7. Which of these statements about the process of biochar is MOST FALSE?

- A) The process of immediate decay of biomass products is avoided by creating biochar
- B) Biomass must be obtained in a sustainable way if it is to lead to a reduction in atmospheric CO₂
- C) Bioenergy has a greater potential to reduce atmospheric CO₂ than biochar
- D) Although biochar results in mostly negative CO₂ emissions, some CO₂ returns to the atmosphere from the decay of biochar in soils
- E) Uncertain

8. Which of these questions about biochar and fossil fuel offsetting is MOST FALSE?

- A) Machinery used to transport biomass to the pyrolysis facility will account for an increase in atmospheric CO₂
- B) Incorporating biochar into the soil will increase the amount of CO₂ into the atmosphere
- C) Syngas and bio-oil are combusted to yield energy as well as CO₂
- D) The process heat and energy from syngas and bio-oil combustion can offset fossil emissions
- E) Uncertain

9. Which of these questions about the process of biochar is MOST FALSE?

- A) Photosynthesis is vital to convert atmospheric CO₂ into a more stable form of carbon
- B) Syngas and bio-oils can also be used to increase the productivity of the soil
- C) Biochar can result in negative net atmospheric CO₂
- D) Biochar has the most potential for poor, degraded soils
- E) Uncertain

10. Which of these statements about biochar is MOST FALSE?

- A) Biochar slows the rate of increasing atmospheric CO₂
- B) The need for biochar stems from the idea that humanity should not overstep the threshold of maximum safe cumulative emissions
- C) Methane emissions are increased by amending soils with biochar
- D) Slow pyrolysis yields mostly biomass as an end product, rather than biofuel
- E) Uncertain

Appendix C: Pilot Studies

Eight Utrecht University students read the passage and completed the exam, and gave feedback about the structure of the experiment and which coping strategies they could have used. These studies showed that the initial maximum reading time for the passage was more than enough to read the passage thoroughly once. It also was made evident that due to the multiple-choice nature of the exam, many participants guessed the answers, thus not making the exam results reflect true comprehension scores. We subsequently decided to add a grading scheme to the 10-question multiple-choice exam whereby participants were given one point for each correct answer, one minus point for each incorrect answer and nothing for each answer left blank. It was also made evident that participants need to know how much time remains. The instructions should also specify that participants will need to know extensive details from the text, since this was somewhat unclear. The coping strategies that emerged are listed in the table below. Average scores (5/10) indicated that the difficulty level was adequate.

Barrier	Coping Strategy
Not having enough time	Re-read the text several times if there is still time remaining of the 10 minutes
Difficult terminology (e.g. offset)	Read the difficult terminology table before reading the text
Too much information	Make a mindmap, with each branch indicating the main idea of a different paragraph
	Use a highlighter to make important parts more memorable
Overload of Information	Take notes throughout, tackle one paragraph at a time
The complicated graph was overwhelming	Refer to the graph more while reading the other paragraphs

Appendix D: Barriers and Coping Planning Strategies for Condition Group

	Possible Barrier	Coping Strategy
1	Encountering difficult scientific terminology	Before you begin, browse the definition table at the end of the passage
2	Being overwhelmed by the difficult sections	Skip these sections and come back to them later
3	Not remembering the important details	After reading the whole passage once, briefly summarize the main ideas of each paragraph. Make sure to use all the time you are given to re-read the passage, take notes and/or underline important parts
4	Not understanding complex processes	Refer to the diagram provided or draw your own mind-map to visually connect the ideas