

The Effects of Feed-Forward Specificity on Students' Self-Directed Learning Skills

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Abstract

In modern education, a growing emphasis is put on the development of self-directed learning (SDL) skills of learners. SDL-skills concern learners' ability to direct the conceptualization, design, conduct and evaluation of their learning. Feedback might support learners' development of these skills, as receiving information on one's own performance can lead to the internal processing of feedback by learners, that could result in adaptations of learning strategies. However, if feedback is too directive, learners might get fewer opportunities to develop SDL-skills. Therefore, feed-forward, a directive feedback element providing learners with directions on how to progress, might limit learners' SDL-skill development. To examine this hypothesis, Dutch students ($N = 60$), writing a paper as part of a Master's level course, were randomly assigned to two feed-forward conditions. In the improvement-oriented condition (IOC), students received information on actions that would improve their current work. In the progression-oriented condition (POC), students received information on actions for effectively progressing to subsequent tasks. Results showed no differences in SDL-skill development between conditions. Analyses of learner characteristics revealed that academic proficiency significantly correlated with SDL-skill development across conditions ($\tau = .25, p < .05$). Implications of these findings are discussed using data from student and teacher interviews.

Keywords: adaptive feedback, self-directed learning, feed-forward, feedback specificity

The Effects of Feed-Forward Specificity on Students' Self-Directed Learning Skills

Self-directed learning skills (SDL-skills) refer to learners' ability to direct the conceptualization, design, conduct and evaluation of their own learning (Brookfield, 2009). The term was coined by Malcolm Knowles in 1975, who described it as a skillset relevant for adult learners (Merriam, 2001). Growing attention has been given to the development of SDL-skills (Bonk, Lee, Kou, Xu & Sheu, 2015). One of the reasons for this interest is the implementation of 'lifelong learning'-policies in the workplace, where employees are responsible for their own ongoing development, often without receiving guidance on making the right decisions (Bolhuis, 2003; Eraut, 2004; Marsick & Watkins, 2001). Therefore, success of lifelong learning policies relies heavily on the ability employees have to direct themselves in their learning processes. To facilitate the transition of students into the workplace and its demands, it is important to investigate facilitators and inhibitors of SDL-skills in learning contexts (Dunlap & Grabinger, 2003).

A trend in education (Mayer & Alexander, 2016) that might hinder the development of SDL-skills is a form of adaptive instruction where a system or a teacher selects the learning tasks that learners have to complete. Adaptive instruction concerns the adjustment of instructional materials and strategies to the needs of individual learners (Park & Lee, 2003). Because of its potential for learning, adaptive instruction has gained popularity (Corcoran & Silander, 2009). Although the use of adaptive instruction for learning might be promising, putting a system in charge of selecting the right instructional material and strategies decreases the responsibility of the learner to critically think about appropriate learning strategies (Wilson, Watson, Thompson, Drew & Doyle, 2017). This distribution of responsibility may put restraints on students' development of SDL-skills. Developments in SDL-skills are visible when learners adjust their learning strategies to meet requirements of a learning situation (e.g., through changes in task selection; De Jong, 1992). These strategic adjustments can be

elicited through critical reflection of learners on their performance and process (Zimmerman, 2002). In adaptive instruction, the necessity for students to engage in self-reflection and improve SDL-skills could be considered low, as an external agent will determine the appropriate learning strategy. So, there is a need for an instructional strategy to develop learners' SDL-skills whilst still profiting from the benefits of adaptive instruction.

A possible solution for developing SDL-skills in the context of adaptive instruction can be found in the provision of feedback. Feedback is described as 'information provided by an agent (...) regarding aspects of one's performance or understanding' (Hattie & Timperley, 2007, p. 81). Feedback has shown to improve students' self-regulation (Butler & Winne, 1995; Hattie & Timperley, 2007). This can be explained through the following process: When a system or teacher provides the learner with information on the quality of their work, this can lead to the internal processing of the information by learners (Narciss & Huth, 2004). The reflection process might lead to strategic adjustments that learners make in their learning trajectory (Earley, Northcraft, Lee & Lituchy, 1990; Narciss & Huth, 2004). Hence, since feedback can activate reflection on self-regulation behavior (e.g., self-judgment or task selection), learners may improve their SDL-skills even when they cannot directly transform their reflections into actions, in situations where a teacher or system is responsible for selecting tasks. It is therefore useful to investigate how feedback might positively influence learners' strategizing abilities caused by developments in learners' self-directed learning skills (e.g., if a learner prioritizes certain learning needs because he improved his ability to evaluate).

Strategic adjustments, as a product of a learner's improved strategizing abilities, can be seen as a form of post-feedback action. An important predictor of post-feedback action (Anseel & Lievens, 2009) is feedback acceptance. Adjusting feedback to each learner's preferences may increase acceptance of feedback (Clark-Gordon, Bowman, Hadden & Frisby,

2019). Feedback becomes adaptive when it is dynamic, varying between learners based on individual characteristics (Sales, 1993). To be able to identify if adapting feedback would promote SDL-skill development, it might be interesting to investigate if and how the development of SDL-skills differs between learners. If, for example, a student's low motivation causes him to refrain from adapting his planning, even though a teacher has pointed out he should make adjustments, he might not develop SDL-skills although he has been provided with the information needed to develop them. This shows the importance of accounting for individual factors in research on feedback.

Developing self-directed learning skills

Before effects of feedback on SDL-skills can be discussed, it is important to get a deeper understanding of what constitutes self-directed learning and how SDL-skills develop. Self-directed learning concerns a learner's management of their entire learning trajectory (Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010). To develop SDL-skills, self-regulation skills (SRL-skills; Loyens, Magda & Rykers, 2008) regarding management of specific learning tasks need to be acquired (Saks & Leijen, 2014). SRL-activities can be divided in three phases (Zimmerman, 2002). In the forethought phase, a self-regulated learner analyses the tasks at hand. In the performance phase, strategies planned out in the forethought phase are carried out. In the reflection phase, self-judgment on undertaken actions can lead to changes in the behavior of learners in the next forethought phase.

To develop SDL-skills, learners need to practice with the management of their entire learning trajectory (Corbalan, 2008; Jossberger et al., 2010). However, SDL-skills are prerequisite for managing one's learning process (Corbalan, Kicken, & van Merriënboer, 2010). It has been found that this problem, referred to as the self-directed learning paradox, may be solved if an external agent decreases its level of control by gradually providing more control to students as their SDL-skill level increases (Corbalan et al., 2010). Since external

control generally remains very high in adaptive instruction where a teacher or system selects the right tasks, it is interesting to investigate if it is possible to use feedback to grant learners with opportunities to practice SDL-skills.

The role of feedback for improving SDL-skills

The beneficial effects of feedback on self-regulating skills have been proven in various studies (e.g., Butler & Winne, 1995; Nicol & Macfarlane-Dick, 2006; Schunk & Zimmerman, 2007), but the type and content of feedback influences the effects greatly (Pridemore & Kline, 1992). Effective feedback consists of information on the goals a learner needs to reach (feed-up), the current progress towards the goal (feed-back) and the activities that need to be undertaken for better progress (feed-forward; Hattie & Timperley, 2007). Depending on its purpose, feedback can be either summative (to substantiate decisions) or formative (to stimulate modifications in learners' behavior or thinking; Chambers, 1994; Harlen & James, 1997; Shute, 2008). Feedback can be aimed at four levels (Hattie & Timperley, 2007). The task-level, containing information on the correctness of the responses (e.g., "That is correct!"); the process-level, containing information on deeper processes relevant when working on a task (e.g., "I would try doing this with a different strategy"); the self-regulation-level, containing information aimed at metacognitive skills (e.g., "How are you going to tackle this problem?"); and the self-level, containing information aimed at the person performing the task (e.g., "You are a great student!"). Effective feedback should contain information on multiple levels. Especially the combination of task- and process-level has shown to be effective (Earley et al., 1990; Hattie & Timperley, 2007), as task-level feedback can improve self-efficacy, which may support learners in strategy searching after receiving process-level feedback.

Feedback generally consists of two parts, a verification component indicating whether a task is executed in a correct manner (e.g., a green check mark next to an answer), and an

elaboration component providing additional information on a task or topic (e.g., an explanation of why the answer is correct) (Narciss & Huth, 2004). The specificity of feedback is defined as “the amount of information on responses beyond their accuracy” (Goodman, Wood & Hendrickx, 2004). There is no consensus on the optimal specificity of feedback (Krijgsman et al., 2019). Some studies state that for optimal learning, feedback should be as specific as possible (Moreno, 2004; Song & Keller, 2001). However, studies comparing transfer scores for learners receiving highly specific feedback versus learners that receive less specific feedback show no significant differences (Goodman et al., 2004; Phye & Sanders, 1994). Since specific feedback tends to be more directive than facilitative (Shute, 2008), it could be argued that less specific feedback helps experienced learners to practice their SDL-skills, by giving them more control over the management of their learning trajectory. This argument is supported by findings of Goodman et al. (2004), who found that students receiving highly specific feedback were less able to respond to poor performance. This was partly because they did not practice with responses for these situations as the feedback continuously guided them to the correct behavior.

A need for research on feedback specificity

Previous studies have investigated effects of feedback specificity by giving outcome feedback after completing the entire task in low specificity conditions, and giving correct response feedback whenever an error was made during the task in the high feedback specificity condition, in addition to outcome feedback (Goodman et al., 2004). Authors from this study stated that to establish generalizability on effects of feedback specificity, a focus on interaction between specificity and other dimensions of feedback should be investigated.

A yet-to-be researched topic is the effect of specificity of feed-forward messages on students SDL-skill development. Feed-forward has strong directive properties, as it provides the learner with concrete options for further action (Orsmond, Maw, Park, Gomez & Crook,

2013). As information in feed-forward goes beyond whether student output is correct or incorrect, including it in feedback messages will increase feedback specificity. Therefore, it could be expected that limiting information in feed-forward messages may lead to developments in SDL-skills of experienced learners, by increasing the control a student has for managing their learning trajectories. Feed-forward information can be divided into two categories: information on actions required to improve the current output, and information on actions required to effectively progress from the current output to subsequent tasks (Hattie & Timperley, 2007). When restricting the information to one of the two categories, feed-forward specificity can be limited. To be able to determine how feedback specificity can best be limited for the improvement of SDL-skills, an analysis of differences in SDL-development between groups of learners that either receive information on improving current output, or information on progressing to subsequent tasks is needed.

Learner Characteristics Influencing Feedback Effectiveness

There are a lot of inconsistencies in effect findings of feedback studies (Hattie & Timperley, 2007), which might be because the effects of feedback strongly depend on the characteristics of the receiver of feedback (Narciss & Huth, 2004). For example, the effects of gender on feedback effectiveness has been shown in a study by Narciss et al. (2004). Secondly, the importance of including motivation variables in research on feedback processing has been stressed by many authors (e.g., Komarraju, 2013; Narciss et al., 2004; Pintrich, 1999; Timmers, Braber-Van Den Broek & Van Den Berg, 2012). Thirdly, proficiency of learners, referring to a student's academic ability, has found to impact feedback preferences in a different manner. In a study carried out by Lee (2008), it was found that low-proficiency students showed less interest in hints for error correction than high-proficiency students. Finally, cultural backgrounds of students may influence their feedback preferences. De Luque and Sommer (2000) found that students from individualist cultures prefer direct

feedback, focused on the individual-level. Students from collectivist cultures were found to prefer implicit, indirect feedback, focused on the group-level. As these differences may affect results of the feedback intervention, it is interesting to gather data on students' individual characteristics.

In conclusion, there seems to be a need to investigate how feedback specificity can be limited to facilitate developments in students SDL-skills. Findings could be used to inform design of adaptive control systems. The research question of this thesis will be: How does manipulating feed-forward specificity influence learners' development of self-directed learning skills? Additionally, after answering this main question, an attempt will be made to find indications of possible influences of students' characteristics such as gender, proficiency, motivation or cultural backgrounds on the effects of the intervention.

Besides the practical value of this thesis, this study will contribute to the current research in two ways. Firstly, it will assess the effects of feedback specificity on the development of SDL-skills, as previous research has focused on other related dimensions, such as exploration strategies (Goodman et al., 2004), learning opportunities (Goodman & Wood, 2004), performance (Davis, 2005), and learning (Goodman & Wood, 2004; Goodman et al., 2004). Secondly, it manipulates specificity in a different way than previously done, exploring differences between feed-forward information on improving current output versus information on effectively progressing to subsequent tasks.

Method

Design

This study was carried out using a mixed methods design, integrating quantitative and qualitative data. This method was chosen because it allows the research question to be answered more in-depth and from different angles. Semi-structured interviews with students

and the teacher helped interpreting the quantitative results. Additionally, these interviews were used to gather insights on short-term changes in SDL-skills, as self-directed learning is a hard to measure concept and changes in SDL-skills take time before becoming noticeable (Kocaman, Ugur & Dicle, 2009).

To determine the minimum amount of participants, an a priori power analysis was conducted using the algorithm for ANCOVAs developed by Borm, Fransen and Lemmens (2007). The expected effect size (.32) is based upon comparisons of effect sizes in other studies on feedback specificity. The analysis revealed a minimum of 53 participants is needed for a power of .80 ($\alpha = .05$).

Feedback conditions. For this study, a comparison is made between two conditions receiving a different type of information on how to progress (feed-forward). Participants in the *improvement-oriented condition* (IOC) only received information on actions that can be undertaken to improve their current outcomes, while participants in the *progression-oriented condition* (POC) only received information on how to effectively progress from their current position to subsequent tasks. Examples of feedback for both conditions can be found in Appendix A.

Feed-up and feed-back. The feed-up and feed-back dimensions were not manipulated for this study. The teacher was free to administer these feedback parts as he considered to be suitable, with the requirement that this information would be the same for both conditions. This autonomy is given to prevent overloading the teacher with instructions, as this could distract from the intervention. The teacher planned to give students information on the goals of the assignment (feed-up) through an online video that could be accessed throughout the course, combined with instructions in the course manual. To communicate students' current position in relation to these goals (feed-back), the teacher gave a rating of level A, B, or C for

every students' work in every feedback session (A being the highest level and C being the lowest level).

Feedback frequency. Optimal feedback frequency has often been studied in the context of psychomotor skills (e.g., Wulf, McConnel, Gärtner, & Schwarz, 2002), where some results indicate that receiving feedback in approximately 50% of the learning sessions resulted in the best learning outcomes (Hemayattalab & Rostami, 2010). How this relates to cognitive learning tasks has yet to be researched, but as it has been established that a high frequency of feedback will be detrimental for learning (Lam, DeRue, Karam & Hollenbeck, 2011), feedback sessions were scheduled every other week.

Teacher support and monitoring. To support the teacher in giving feedback in line with the conditions, a document with feedback examples was developed by the researcher. For each of the four feedback levels as described by Hattie & Timperley (2007), an example of feed-forward for both conditions was added (see Appendix A). The researcher discussed the examples with the teacher in a videocall that took place before the first feedback session, to minimize possible misinterpretations. The teacher could contact the researcher for questions or help during the intervention period.

The teacher wrote down the feedback for each individual piece for every feedback session and sent this to the researcher. These written documents were analyzed by the researcher for adherence to the protocol. After every feedback session, the researcher and teacher met up to discuss deviations from the intervention.

Participants

Data was collected in a course from a Masters' program from the faculty of Law, Economics and Governance at Utrecht University. The sample has been selected based on availability, through contacting various course coordinators. 60 adult students were enrolled

in this course, of which 51 completed the pretest measures in the first tutorial group. In addition. Students that were absent during this tutorial received the questionnaires and consent forms via e-mail, of which three students completed the pretest measures before the first feedback session.

The sample consisted of 27 male and 27 female students. Prior education varied greatly, 17 students reported finishing their bachelor in another country, 29 students reported having studied in the Netherlands, from which 17 did their bachelor at Utrecht University university, 13 at the faculty of Law, Economics and Governance.

For this course, participants had to write a research paper in groups of six students. Each individual student selected three preferred topics for the paper out of a list with ten topics. The topics were selected by the teacher, based on the learning goals of the course. The teacher assigned the participants to a topic group based on their preferences. A randomization tool was used to randomly divide the groups across the conditions. All groups had equal possibilities to be assigned to one of the two conditions.

Instruments

Questionnaires.

Self-directed learning skills. SDL-skills were measured with a modified version of the Self Rating Scale of Self-Directed Learning (SRSSDL) (Williamson, 2007). The original instrument consists of 60 items with six subscales: awareness, learning strategies, learning activities, evaluation and interpersonal skills. For this study, the subscales learning strategies and learning activities are excluded, as there is no indication to expect learning strategies or activities to change during the learning trajectory. Changes in strategies might happen in future learning tasks as a result of changes in reflection, which will be measured through the

evaluation scale. The questionnaire was found to be highly reliable (35 items, $\alpha = .83$). The instrument is included in Appendix B.

Motivation. Motivation was measured using a modified version of the task evaluation questionnaire, consisting of items of the Intrinsic Motivation Inventory (IMI; Deci, Eghrari, Patrick, & Leone, 1994) that are adapted to fit the purpose of the current research. In this study, the modified IMI assessed students' interest and enjoyment (5 items, $\alpha = .87$), perceived competence (3 items, $\alpha = .78$), pressure/tension (5 items, $\alpha = .64$) and perceived choice (5 items, $\alpha = .83$). on a specific task. There is strong support for validity of the scale (McAuley, Duncan, & Tammen, 1989).

IMI items can be modified slightly to fit specific activities. In this study, all items of the task evaluation questionnaire that could be used as both pre- and post-measures were included. Two separate questionnaires with different formulations of the same 18 items were used. Regarding the pre-test measurement, participants were asked about how motivated they expect to be when working on the task (e.g., "I think doing this assignment will be fun"), whereas the post-test questions evaluated the level of motivation participants experienced during the task (e.g., "Doing this assignment was fun"). The IMI was found to be highly reliable ($\alpha = .87$). Both questionnaires are included in Appendix C.

Culture Orientation. Learners' culture orientation will be measured with the Culture Orientation Scale (COS; Triandis & Gelfland, 1998). This 16-item questionnaire measures both collectivism and individualism on two dimensions: vertical (the extent to which a person is willing to accept hierarchy/inequality) and horizontal (the extent to which a person perceives equality as ideal/current reality). The individuality subscale consisted of 8 items, ($\alpha = .74$), and the collectivity subscale consisted of 8 items ($\alpha = .66$). There is support for the validity of the scale (Oyserman, Coon & Kimmelmeier, 2002; Gudykunst & Lee, 2003). The instrument is included in Appendix D.

Other learner characteristics. Information on gender (male/female/other) will be obtained through a separate question in pretest measures. Proficiency scores, as an indication of a learners' academic ability (Lee, 2008), will be measured by asking students to report their weighted average grade for the Master's program.

Semi-structured interviews. One-on-one interviews were scheduled within two weeks after the final feedback session. Interviewees were four students from the IOC and three students from the POC. The duration of these interviews ranged between 30-90 minutes. Students received no financial reward for their participation. Semi-structured interviews explored consequences of the intervention on SRL-activities and generalizations for the self-direction of the learning trajectory more in-depth. Students were asked to compare their actions in the forethought, performance and reflection phases (Zimmerman, 2002) during the assignment in this course with actions in previous assignments. Explanations for eventual changes in strategizing behavior within these phases were discussed. Students were also asked how they thought the provided feedback influenced their future learning strategies.

The teacher also participated in a 30-minute semi-structured interview, covering his experiences during the intervention period and his perceptions and interpretation of the impact of feedback on student output. Possible external factors that could have influenced results were also discussed in this interview. The full topic list for the interviews can be found in Appendix E.

Procedure

Before the intervention period, the feedback protocol for both conditions was developed together with the teacher. In the second tutorial group, participants filled in informed consent forms (see Appendix F). Once informed consent was given, answers on IMI, SRSSDL, and COS questionnaires and demographic data were collected.

In the second, fifth and sixth week of the intervention period, participants received feedback according to their assigned condition. Participants had to schedule a meeting with the teacher together with their group, where each student would get feedback on their individual work in a group videochat. Two to seven days after each feedback session, the teacher and researcher met up to discuss the intervention progress.

At the end of the intervention period, in the final tutorial group, IMI and SRSSDL questionnaires were administered again. The researcher then asked all students if they were willing to participate in an interview, seven students agreed to participate.

Data from the questionnaires and interviews were processed as described in the data management plan (Appendix G).

Data analysis

To answer the main research question, an independent sample *t*-test was conducted using IBM SPSS Statistics 25. The analysis included the feed-forward conditions as independent variable, SDL-skill improvement (the increase of the SRSSDL-score from pre- to posttest) as the dependent variable. To investigate whether individual characteristics might have influenced the feedback effects, the *t*-test was followed by multiple ANCOVAs, with feedback specificity as independent variable, and SDL-skill improvement as dependent variable, and learner characteristics (gender, proficiency, motivation, and culture orientation) included as covariates. For further exploratory analyses, correlations between learners' motivation, proficiency, gender, culture orientation, educational background and SDL-skill improvement were analyzed.

The outcomes of the quantitative analyses served as input for student and teacher interview topics, which were transcribed and imported in the qualitative data analysis software Nvivo 12 Pro (Welsh, 2002) for thematical coding.

Results

Main research question

For all statistics tests in the sections below a significance level of .05 was maintained. An independent samples t-test was used to investigate the impact of feed-forward information on the improvement in self-directed learning skills. Inspections of skewness, kurtosis and Shapiro-Wilk statistics indicated that the assumption of normality was supported for both conditions. Levene's test was non-significant, $F(1, 39) = 0.02, p = .888$, and thus the assumption of homogeneity of variance was not violated. Analysis of differences in pre-SDL scores revealed no significant difference between the feed-forward conditions in the pretest, $t(42.95) = 1.77, p = .084$, two-tailed, $d = 0.53$, 95% CI [-0.02, 0.38].

Table 1.

Descriptive overview of self-directed learning scores per condition

	Improvement oriented condition			Progression oriented condition		
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>
Pre-SDL score	23	3.88	.35	22	3.70	.33
Post-SDL score	23	3.82	.37	20	3.80	.34
SDL-improvement	22	.00	.31	19	.04	.25

The independent t-test revealed no main effect for feed-forward condition and development of self-directed learning skills. This indicates that the group that received information on concrete actions for improvement of current work and the group that only received information on concrete actions for progressing to subsequent tasks do not show significant differences in their SDL-skill development, which was measured by the difference in SRSSDL scores from pretest to posttest, $t(38.90) = -.48, p = .630$, two-tailed, $d = 0.15$, 95% CI [-0.23, 0.14]. Descriptive analyses on students' self-directed learning development

between conditions, including pretest scores, posttest scores and improvement scores (from pretest to posttest) on the SRSSDL, can be found in Table 1.

Exploratory analyses

For the additional exploratory analyses, a one-way analysis of covariance (ANCOVA) was used to examine the impact of motivation, culture orientation, gender and academic proficiency on the relationship between the feed-forward conditions and SDL-development.

The ANCOVA indicated that motivation subscales were not significantly related to SDL-skill development. Interest/enjoyment: $F(1, 38) = 0.25, p = .620$, partial $\eta^2 = .007$; perceived competence: $F(1, 37) = 1.12, p = .298$, partial $\eta^2 = .029$; perceived choice: $F(1, 38) = 0.03, p = .873$, partial $\eta^2 = .001$; pressure/tension: $F(1, 36) = 0.09, p = .311$, partial $\eta^2 = .028$. In addition, cultural orientation was not significantly related to SDL-skill development either: individuality: $F(1, 37) = 1.80, p = .188$, partial $\eta^2 = .046$; Collectivity: $F(1, 38) = 0.06, p = .805$, partial $\eta^2 = .002$. Lastly, gender showed no significant relation to SDL-skill development $F(1, 38) = 0.06, p = .813$, partial $\eta^2 = .001$. Descriptive analyses of these variables can be found in Tables 2 and 3.

Table 2.

Descriptive overview of SDL-skill development per gender and condition.

	SDL-skill development			
	Improvement-oriented condition		Progression-oriented condition	
Gender	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Male (<i>n</i>)	.04 (11)	.41	.02 (10)	.20
Female (<i>n</i>)	-.04 (11)	.18	.32 (9)	.32

Table 3.

Descriptive overview of motivation variables per condition.

Variables		Improvement-oriented condition			Progression-oriented condition		
		<i>N</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>
Interest/enjoyment	Pre-test	25	4.92	1.15	23	4.69	1.30
	Post-test	25	4.18	1.37	22	4.35	1.24
Perceived competence	Pre-test	25	4.51	.97	22	4.68	.99
	Post-test	24	4.01	1.38	23	4.61	1.03
Perceived choice	Pre-test	24	4.08	1.33	23	3.82	1.42
	Post-test	24	3.97	1.06	23	3.71	1.42
Pressure/tension	Pre-test	25	3.86	.81	22	4.00	1.22
	Post-test	23	4.28	1.13	22	4.11	1.06

For the ANCOVA including academic proficiency, examination of Shapiro-Wilk statistics and histograms for each group indicated that the ANCOVA assumption of normality was supported. Scatterplots indicated that the relationship between the covariate (academic proficiency) and the dependent variable (SDL-skill development) was linear. Finally, the assumptions of homogeneity of regression slopes and homogeneity of variances were supported by the absence of a significant IV-by-covariate interaction, $F(2, 36) = 2.78, p = .076$, and a non-significant Levene's test: $F(1, 37) = 0.15, p = .703$. Academic proficiency was statistically significantly related to SDL-skill development, $F(1, 36) = 5.38, p = .026$, partial $\eta^2 = .130$. However, the effect of feed-forward conditions on SDL-skill development remained non-significant, $F(1, 36) = 0.07, p = .799$, partial $\eta^2 = .002$.

To further investigate the relation between academic proficiency and SDL-skill development, a Kendall's tau-b correlation test was carried out, showing a weak, positive correlation, $\tau = .25, p < .05$, two-tailed, $N = 40$. This indicates that self-reported SDL-

development was higher for students with a higher weighted average grade on the Masters' program as compared to students with a lower weighted average grade.

As a final exploratory analysis, correlations between all variables that were processed in the previous analyses were analyzed. Results of this analysis are shown in Table 4.

Table 4.

Correlation table of all included variables

<i>Variable</i>	<i>1.</i>	<i>2.</i>	<i>3.</i>	<i>4.</i>	<i>5.</i>	<i>6.</i>	<i>7.</i>	<i>8.</i>	<i>9.</i>	<i>10.</i>	<i>11.</i>
1. Condition											
2. SDL-improvement	.11										
3. Interest/enjoyment	.02	-.12									
4. Competence	.18	.13	.27*								
5. Perceived choice	-.11	-.07	.47**	.22*							
6. Pressure/tension	-.10	-.15	-.02	-.39**	-.08						
7. Gender	-.13	-.03	-.15	-.14	-.02	.15					
8. Ac. Proficiency	.18	.25*	-.02	.17	.00	.05	.15				
9. Individuality	-.11	.10	-.02	-.03	-.01	-.06	-.15	.01			
10. Collectivity	.07	.41	-.09	-.08	.07	-.07	-.02	-.01	.17		
11. Prior education	-.08	.96	-.02	-.06	-.01	.33**	.10	.11	-.16	-.03	

** $p < .01$, * $p < .05$

Significant correlations were found between competence and interest/enjoyment subscales $\tau = .27$, $p < .05$, two-tailed, $N = 46$, between competence and perceived choice subscales $\tau = .22$, $p < .05$, two-tailed, $N = 46$, between competence and pressure/tension subscales, $\tau = -.39$, $p < .01$, two-tailed, $N = 44$, and between interest/enjoyment and perceived choice subscales $\tau = .47$, $p < .01$, two-tailed, $N = 47$.

Apart from correlations between motivation subscales, a positive significant motivation between and prior education and the pressure/tension subscale was found, $\tau = .33$, $p < .01$, two-tailed, $N = 43$. This indicates that students who finished their previous studies in

the Netherlands reported feeling less pressure/tension than students who finished their previous studies outside of the Netherlands.

Delivery of the Planned Intervention

Through meetings with the teacher, analysis of written feedback and student interviews, statements can be made about the strength of the intervention design. The biggest deviation was that, for the first feedback session, students in both conditions received progression-oriented feedback. This deviation occurred because the teacher wanted to give both groups an equal amount of feedback. As the first feedback session took place in week 2 of the intervention, students were only at the beginning of their writing process. The teacher felt that giving information on how to improve current work would be significantly more brief than information on how to progress. For the purpose of equality, he decided to give students in both conditions the same, progression-oriented feedback in the first session.

The text analysis of the written-out feedback and the interview with the teacher showed that the feedback in the second and third sessions were well-aligned with the intervention design. If students asked direct and specific questions about improving their current work (in the POC) or about progressing to subsequent tasks (in the IOC), the teacher would give them this information. The teacher reported he stayed alert that this additional feedback was strictly limited to the question of the student.

As an extra check, the intervention was explained during the student interviews, after treatment. Students were asked if they felt like the described feedback for their condition was the feedback they had been given. Five out of seven students confirmed that the described feedback matched their experiences. The deviating students (one from the IOC, one from the POC), reported they felt like the feedback was still not concrete enough. Taking this into account, it can be stated that with the exception of the first feedback session, the intervention

design has been respected, as reported by the teacher, indicated by the analysis of written feedback, and stated by the majority of interviewed students.

Feedback Evaluation

Student interviews indicated that the feedback conditions often were unimportant for their opinions on the intervention. Therefore, conditions will only be explicated when this is needed for the interpretation of the results. If a statement contains no explicit reference to a condition, it was supported by students in both conditions.

Use of feedback. Interviews indicated that students attached great importance to processing the feedback in accordance with the teacher's view. Most participants reported that they directly adopted suggestions from the feed-forward information they had been given. If this instructions were found unclear, students often collaborated with group members to discuss possible interpretations, to still be able to process the feedback.

The motivation to process the feedback stemmed from the students' belief that implementing the feedback would increase their chance to pass this course, which was the main motivation for writing this paper for many students. This also caused most students to process feedback they did not agree with without discussing it with the teacher, to avoid possible harm to their grade.

Opinions on feedback. Six interviewed students indicated they experienced the feedback to be vague or unclear. Despite this feeling, they could often rationalize how this vagueness could benefit their development, but they also reported it lead to a higher workload. Also, they noted they felt that the development of their skills did not correlate with getting a higher grade or a better written paper. One student in the IOC captured this sentiment with the following quote:

I think it went fine. I think if [teacher] would have said: you need to add this and this, that you would end up with a tunnel vision. For us, the options were open and we could see for ourselves what we would like to add. But I don't know if this has also benefitted our quality, because we were searching [for the right approach] for a long time. (Student interview 7, 2019, p. 8)

The ambiguity of compliance. There were a lot of different opinions on the responsibility the teacher had in their supervisory role. Students that were frustrated with the feedback they had gotten often felt like it is the duty of the teacher to tell students what steps they should take, to enable them to learn. What also adds to this is the students belief that for this course, producing the results the teacher wanted to see would result in a higher grade. It is plausible that the feedback is received negatively because it is less clear what the teacher wants, which clouds the path to passing the course and adds pressure on the students.

Students that were less bothered by the vagueness of the feedback also noted that taking ownership of their choices in the paper instead of complying with the teachers wishes grade could negatively impact their grade, although they mostly did not view this negative impact as disabling to their learning. However, these students mentioned that this system would not work for everyone, and that interference or teacher support might be necessary in certain cases.

He [the teacher] leaves you swimming. If that is his intended strategy, as in: we have to solve this ourselves, I could understand that because on the one hand it can make you a lot wiser. On the other hand, we are here to learn. Making people swim in nothingness, well, that would solve a lot and lead to more learning for one person, where another person would be stuck swimming in circles. You don't want a situation in which someone has to rewrite his entire piece because the work does not fall into place. (Student interview 6, 2019, p.8).

Influences of personal factors. When asking students about factors they thought might influence the impact of the feedback on the individual level, they often referred to their experience in the Dutch educational system. They noted that foreign students with fewer notions on how the system works and the height of the workload, reported more adverse feelings towards the feedback intervention. According to both the teacher and the interviewed students, foreign students from different educational systems (both parties explicitly mentioned students with Asian backgrounds) also seemed to be more bothered by the directness of the feedback, perceiving points of improvement as critique, which was detrimental for their self-esteem.

Also, two students who expressed greater understanding of the feedback benefits, referred to their experience in the workplace. They brought up different reasons for this: The first student explained that working in different departments and presenting reports to a multidisciplinary team lead to experience with creating a shared understanding of concepts, that also helped with processing the feedback. The second student noted that the freedom he gets in the academic world to improve your own research capabilities is not something he got in the workplace. He seemed to attribute the development of his research skills to this freedom, which made him more appreciative of the intervention.

Development of Self-Directed Learning Skills

Students were asked what they thought they had learned from this assignment. Students expressed difficulty in explicating this, noting that learning in that sense was 'often something that happens subconsciously'. Generalizations of learning experiences that they made from this assignment were often centered around group processes and things they would have done differently in communication.

As the interviews progressed, students reported on other insights they gained from reflecting, such as the amount of time they should have spent on a certain part, or about different strategies that would have helped them better during the paper. To determine the impact of the intervention, it is necessary to look at how they got these reflections.

Cues that lead to strategy development within the paper. There were numerous cues that caused students to alter their strategy while working on the assignment. Firstly, the categorization of student work into quality levels was named by two students to create breeding ground for critical reflection.

Before I incorporated the feedback I was like, my part is actually quite good. And then I got the feedback and I was critical about myself. And then I was like: okay probably it is not that good. Maybe there is some space to improve. (Student interview 1, 2019, p. 7)

One student from the progression-oriented condition also noted that because the feedback made clear that improvement was necessary, but he felt in charge of the direction of this improvement. So because of the limited feed-forward specificity, critical reflection is needed to proceed. He felt like this helped him with actively processing the feedback in mind, instead of just copying all suggestions.

Other cues that lead to adjustments were the specific feed-forward elements students got. If the teacher indicated a student should also incorporate topic X (for the progression-oriented condition), this became the focus of students when working on the assignment. If the teacher indicated a student should focus on improving part Y (for the improvement-oriented condition), they would focus on this when improving the assignment.

Motivation for processing cues. When asked about motivations to make use of the cues, the main motivation was improving their grade. In some cases, cues were deliberately

ignored. Reported reasons for this were: lack of time; too much effort to process the cue for the expected result; discrepancies between own experiences of what worked and the cues they had gotten; evenly balancing responsibilities and related pressure and workload within a group.

Teacher Evaluation

In addition to the results above, the interview with the teacher revealed some interesting insights. Firstly, the teacher indicated experiencing greater issues with separating the two conditions than he expected. He reported spending more time than expected to adequately distinguish progression-oriented feedback from improvement-oriented feedback.

Secondly, the teacher reported he thought students who previously studied in foreign countries disliked the feedback from the IOC more than the feedback from the POC, as the IOC feedback was perceived as more direct, and was sometimes received by students as offensive rather than helpful.

Lastly, the teacher reported feeling as if students learned more compared to other years in which he thought this course. He felt as if this improvement was due to the time he invested in the feedback and the elaborateness of the feedback.

Discussion

There is a growing need to support learners in developing their SDL-skills in adaptive instructional contexts where an external agent (e.g. the teacher) has control over task selection. This instruction method is believed to prevent learners from developing their SDL-skills because learners can develop SDL-skills by taking control and responsibility over their learning trajectory. This study investigated whether a feed-forward manipulation (suitable for integration in adaptive instruction methods) could positively influence learners' SDL-skill development. Interpretations of the results will be discussed below.

SDL-Skill Development Within and Between Conditions

The hypothesis of this paper was that limiting feed-forward specificity would stimulate learners' SDL-skill development. Therefore, it was unexpected that SDL-improvement scores indicated no significant developments in SDL-skills in both conditions. This result also contradicted the findings of Goodman et al. (2004), who found that higher feedback specificity increased students' ability to respond to unknown situations. A possible explanation for this result is that developing SDL-skills takes time (Kocaman, Ugur & Dicle, 2009). If the effects of feed-forward specificity on SDL-skills had been studied for a longer period, the developments might have been significant.

In contrast to quantitative findings, however, possible indications of SDL-skill development were detected in the interviews, revealing that a more nuanced interpretation of the quantitative analyses may be appropriate. Students from both conditions reported that the feed-back categories, indicating their position towards the goal, triggered critical reflection. Because of the categorization, students could monitor if the quality of their work as perceived by the teacher was in line with their desired quality. If students experienced discrepancies between judgments, students made the effort to find out how to bridge the gap. As students often felt that they did not receive many concrete actions on how to improve (as intended by the intervention), they reported either collaborating with peers to strategize in the best possible way, or critically reflect upon their own work to come up with improvements. The way critical reflection lead to changes in strategies might indicate developments in self-regulated learning according to the model of Zimmerman (2002). The reduced feed-forward specificity might have caused them to take greater responsibility in the management of their learning trajectory, providing practice necessary for SDL-skill development (Loyens, Magda & Rykers, 2008). This difference in findings within this study further stresses the importance for future studies to investigate the long-term effects of feedback specificity interventions.

Results revealed no significant differences in SDL-development between the improvement-oriented conditions and the progression-oriented condition. This indicates that the way in which feed-forward specificity was limited did not influence students' development of self-directed learning skills. As this is the first study where multiple methods of limited feedback specificity are compared, there was no hypothesis from the literature for one of the conditions to promote SDL-skill development more. However, the absence of significant differences needs to be interpreted with caution for two reasons. Firstly, the teacher reported giving both conditions progression-oriented feedback in the first feedback session, which reduced differences between conditions, making it harder to detect the effect of the manipulation. Secondly, as described above, the quantitative development scores might not reflect actual development. Future research should be conducted to confirm or refute the effect of the manipulation.

In summary, it can be stated that the way in which feed-forward specificity was manipulated in this study did not seem to influence students' self-directed learning skills. Limiting the specificity may have facilitated SDL-skill development, but future studies should investigate this. When transferring these findings to the design of adaptive instruction, it is important to take into account that in this context, students often reported strategizing together with peers. The importance of sharing knowledge with others to integrate insights from critical reflection for stimulation of self-directedness is also pointed out by Garrison (1992; 1997). This might indicate that for SDL-development within adaptive instruction, adaptation on the team-level, where instruction is adapted to both individual and team needs (e.g., Sottolare et al., 2018), may be beneficial. Future studies should investigate the impact of this adaptation in the context of SDL-skills.

Impact of Learner Characteristics

With regard to the impact of learner characteristics, a remarkable find was the significant positive correlation between academic proficiency and SDL-skill development. This finding could be explained the importance of relevant task knowledge for the amount of control on their learning trajectory a learner can handle. Possessing relevant task knowledge helps students with task selection, as it improves students' ability to recognize what future tasks match their learning needs and are better at integrating this selection in their current framework of knowledge (Corbalan, Kester & Van Merriënboer, 2011). Academic proficiency might serve as an indicator of learner's expertise levels, which could be predicting the amount of relevant task knowledge a learner possesses (Kirschner, Ayres & Chandler, 2011). This would align with the finding that more proficient students developed their SDL-skills more in this study, as they would have a larger ability to use the control they got from the limited feed-forward specificity.

An additional explanation for this finding can be taken from the interview data. Interviews showed that the main goal of students was to pass the course. Strong indications were found for the belief students held that compliance with the teacher's feedback would directly benefit their grade. This also impacted their evaluation of strategies, three interviewed students indicated they would evaluate the successfulness of their strategy based upon the teachers judgment. What this means in connection to their learning goals, is that they view successfulness as the extent to which you can comply with the teacher, instead of knowledge or skill gains.

From this perspective, attempting to develop SDL-skills could pose a risk to their success. By taking more control over the management of learning trajectory instead of copying the teachers proposed strategies, it is more likely that the end result deviates from the teacher's view. Students that were at higher risk of not passing the course, might have spent more time trying to figure out what the teacher meant, instead of trying to develop the strategy

they deemed best. As academic proficiency was measured by the weighted average grade of the Master's program this variable could be interpreted as an indication of the probability of successfulness in the assignment. Therefore, academic proficiency might be directly related to how much attention students paid to the teachers wishes instead of their own development, causing students with higher proficiency to develop their SDL-skills more.

This interpretation is in line with findings from Lee (2008), who found that teacher-centered feedback made students more passive and demanding. The possible rationale behind this mechanism as described above adds new insights to his work. More specifically, this study revealed a conflict between higher grades and greater SDL-skill development. This indicates the need for promoting other methods of assessing students' proficiency. This argument is in alignment with the views of Schwab, Mosely and Dustin (2018), who stated that using a unidimensional measure to represent the multidimensionality of the human potential would be suboptimal. Including different assessment strategies in instruction might alleviate a students' urge for compliance, leaving more room for SDL-skill development. This hypothesis should be tested in further research.

Contradicting the expectations, no significant correlation was found between motivation constructs and SDL-skill development. This can be explained by regarding motivation as a relational concept (Ahl, 2006). In this study, students' motivation for the assignment was measured, but that motivation might not fully represent how motivated learners were to process the feedback. For example, interviews showed that opinions on the teacher severely impacted their motivation to process the feedback. It is likely that this influenced their feedback acceptance (Clark-Gordon et al., 2019), and as a consequence, their SDL-skill development. Future studies should take the relationality of motivation into account in their designs, and critically consider including dimensions of motivation that may impact the feedback processing outside of task motivation.

Additionally, despite indications from the student and teacher interviews, students' culture orientation did not correlate with SDL-skill development. As the reliability of the Culture Orientation Scale was found to be relatively low in this study, correlations might have gone undetected. However, a more plausible explanation is that it is not students' culture orientation, but students' experiences with the Dutch educational system that impacted their perception of the feedback. This explanation is supported by the significant correlation between pressure and prior education, and by interview statements on feedback perceptions from both international students and the teacher. Few prior experience with a certain type of feedback might cause misinterpretations leading to negative perceptions, which could also explain the correlation between prior education and perceived tension/pressure (Sargeant, Mann, Sinclair, Van der Vleuten & Metsemakers, 2008). However, the different perceptions of feedback because of students' prior education do not necessarily have to impact SDL-skill development. In this study, students' SDL-skill development seems to be mostly impacted by their expertise level, and experience and expertise should not be viewed as interchangeable constructs (Ericsson, Prietula & Cokely, 2007).

Limitations

In addition to the aforementioned limitations, there were a few other factors that may have impacted the results. Firstly, the sample size was sufficient at the pretest, but due to dropouts in the post-test, not all participants could be included in the final analysis, harming the power of the study. As dropouts will be a recurrent problem in research contexts where data is collected in multiple sessions, relying on the presence of students, it is advisable for future studies to search for a sample with a greater margin for dropouts.

Secondly, the students in this sample already scored high on SDL-skills at the start of the research. As this limited the room for improvement, the results might be less reliable due to a ceiling effect (Salkind, 2010). It is likely that this high pretest score was due to the

experience level of the students, as the studied course was on a Masters' level. In future studies, it might be worthwhile to compare samples with varying experience, to be able to correct the results for this.

Thirdly, the fact that students knew their feedback was manipulated, but did not know about the specifics of this manipulation, may have had negative consequences for the feedback acceptance. An example of this is that some students reporting distrusting the categorizations, as they felt like the level they had gotten did not reflect their actual level, and therefore hypothesized the experiment entailed giving people false categorizations to see how they would respond. Combining this insight with findings from Clark-Gordon et al. (2019), who show the importance of feedback acceptance for post-feedback action, gives an indication that this distrust will definitively have impacted the way in which students processed the feedback. Students were informed at the beginning of the research that the feedback would not be misleading or dishonest, but students might have forgotten that during the trial. To prevent these types of effects in future research, it might be important to make the information about the intervention accessible to participants at all times.

Fourthly, differences between quantitative and qualitative results can be interpreted by looking at the nature of the SRSSDL questionnaire. What might have caused the interviews to show indications of improvement, but no development in the quantitative data, is the fact that if the intervention did impact SDL-development, this development would likely be visible in improvements of their self-evaluation skills. As these improvements could directly impact the way students self-assess (Zimmerman, 2002), this might influence the scores students gave on the SRSSDL. For example: a student scored himself "5" on the first item of the SRSSDL "I identify my own learning needs" in the pretest, because he felt like he was very capable of doing so. In the process of writing the paper, he found out he had trouble with clarifying what he needed to progress, as he was used to getting this cut and clear from the teacher. This

realization caused him to reflect on his capabilities. At the post-test, he scores himself a “4” on this item. This example indicates that a negative pre-post SDL score does not necessarily mean the student’s SDL-skills declined, in this context it is more likely this indicates an improved evaluation capacity.

Finally, extending on the previous point, students reported great difficulties in explicating what they had learned in the interviews. The researcher sometimes had to ask multiple follow-up questions on a topic before the students could report on their learning and development. The trouble students had with reflecting on their work could have impacted their assessment of the SRSSDL. For future studies, measuring self-directive behavior would be recommended, as self-report measures could have negatively impacted the study’s validity (Baumeister, Vohs & Funder, 2007).

Final Remark

This study made a valuable contribution to the research on feedback specificity, being the first to explicitly relate feed-forward specificity to self-directed learning. In summary, three theoretical implications can be distilled from the findings. Firstly, this study shows indications that the intervention might have helped students to develop their SDL-skills. Secondly, the results imply that the method in which feedback specificity is limited did not impact learners’ self-directed learning. Thirdly, this study confirms that learner characteristics can have an important impact on SDL-skill development, by revealing a correlation between academic proficiency and SDL-skill development. When relating these implications to the practice of designing adaptive instruction, the key take-away is that when aiming at developing SDL-skills for learners, it should not just be the learning content that is adapted to the learner, but also the level of control a learner has, based on their proficiency.

Important to note is that although the results of this intervention on self-directed learning skills are promising, this study also revealed a, still unexplored, negative side of SDL-skill development. Students reported the intervention increased their stress and perceived workload. The affective aspects of learning often get overlooked, despite their importance (Hill, Healey, West & Dery, in press). This study supports the notion from Crowther (2004) that remaining critical towards lifelong learning policies is crucial. The detrimental effects of striving for SDL-skills should not be ignored, therefore, this study encourages researchers to investigate the relationship between student wellbeing and self-directed learning policies. Before the true value of this intervention can be determined, a complete image of its costs is required.

References

- Ahl, H. (2006). Motivation in adult education: a problem solver or a euphemism for direction and control?. *International journal of lifelong education*, 25(4), 385-405.
- Anseel, F., & Lievens, F. (2009). The mediating role of feedback acceptance in the relationship between feedback and attitudinal and performance outcomes. *International Journal of Selection and Assessment*, 17(4), 362-376.
- Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior?. *Perspectives on Psychological Science*, 2(4), 396-403.
- Bolhuis, S. (2003). Towards process-oriented teaching for self-directed lifelong learning: a multidimensional perspective. *Learning and instruction*, 13(3), 327-347.
- Bonk, C. J., Lee, M. M., Kou, X., Xu, S., & Sheu, F. R. (2015). Understanding the self-directed online learning preferences, goals, achievements, and challenges of MIT OpenCourseWare subscribers. *Journal of Educational Technology & Society*, 18(2), 349.
- Borm, G. F., Fransen, J., & Lemmens, W. A. (2007). A simple sample size formula for analysis of covariance in randomized clinical trials. *Journal of clinical epidemiology*, 60(12), 1234-1238.
- Brookfield, S. D. (2009). Self-directed learning. *International handbook of education for the changing world of work* (pp. 2615-2627). Springer, Dordrecht.
- Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research*, 65, 245-281.

- Chambers, F. (1994). Removing confusion about formative and summative evaluation: Purpose versus time. *Evaluation and Program Planning*, 17(1), 9-12.
- Clark-Gordon, C. V., Bowman, N. D., Hadden, A. A., & Frisby, B. N. (2019). College instructors and the digital red pen: An exploratory study of factors influencing the adoption and non-adoption of digital written feedback technologies. *Computers & Education*, 128, 414-426.
- Corbalan, G. (2008). *Shared control over task selection: helping students to select their own learning tasks*. Unpublished doctoral dissertation. Heerlen: Open Universiteit Nederland.
- Corbalan, G., Kester, L., & van Merriënboer, J. J. (2011). Learner-controlled selection of tasks with different surface and structural features: Effects on transfer and efficiency. *Computers in Human Behavior*, 27(1), 76-81.
- Corbalan, G., Kicken, W., & van Merriënboer, J. J., & (2010). Shared control over task selection: a Way out of the self-directed learning paradox? *Technology, Instruction, Cognition & Learning*, 8(2).
- Corcoran, T., & Silander, M. (2009). Instruction in high schools: The evidence and the challenge. *The future of children: America's high schools*, 19(1), 157–183.
- Crowther, J. (2004). 'In and against' lifelong learning: Flexibility and the corrosion of character. *International journal of lifelong education*, 23(2), 125-136
- De Jong, F. P. C. M. (1992). *Zelfstandig leren. Regulatie van het leerproces en leren reguleren: Een procesbenadering* (Proefschrift). Tilburg: Katholieke Universiteit Brabant.
- De Luque, M. F., & Sommer, S. M. (2000). The impact of culture on feedback-seeking behavior: An integrated model and propositions. *Academy of Management Review*, 25(4), 829-849

- Davis, W. D. (2005). The interactive effects of goal orientation and feedback specificity on task performance. *Human Performance, 18*(4), 409-426.
- Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62*, 119-142.
- Dunlap, J. C., & Grabinger, S. (2003). Preparing students for lifelong learning: A review of instructional features and teaching methodologies. *Performance Improvement Quarterly, 16*(2), 6-25.
- Earley, P. C., Northcraft, G. B., Lee, C., & Lituchy, T. R. (1990). Impact of process and outcome feedback on the relation of goal setting to task performance. *Academy of Management Journal, 33*(1), 87-105.
- Eraut, M. (2004). Informal learning in the workplace. *Studies in continuing education, 26*(2), 247-273.
- Ericsson, K. A., Prietula, M. J., & Cokely, E. T. (2007). The making of an expert. *Harvard business review, 85*(7/8), 114.
- Garrison, D. R. (1992). Critical thinking and self-directed learning in adult education: An analysis of responsibility and control issues. *Adult education quarterly, 42*(3), 136-148.
- Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult education quarterly, 48*(1), 18-33.
- Goodman, J. S., & Wood, R. E. (2004). Feedback specificity, learning opportunities, and learning. *Journal of Applied Psychology, 89*(5), 809.
- Goodman, J. S., Wood, R. E., & Hendrickx, M. (2004). Feedback specificity, exploration, and learning. *Journal of Applied Psychology, 89*(2), 248.

- Gudykunst, W. B., & Lee, C. M. (2003). Assessing the validity of self construal scales: A response to Levine et al. *Human Communication Research, 29*(2), 253-274.
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research, 77*(1), 81-112.
- Harlen, W., & James, M. (1997). Assessment and learning: Differences and relationships between formative and summative assessment. *Assessment in Education: Principles, Policy & Practice, 4*(3), 365-379.
- Hemayattalab, R., & Rostami, L. R. (2010). Effects of frequency of feedback on the learning of motor skill in individuals with cerebral palsy. *Research in developmental disabilities, 31*(1), 212-217.
- Hill, J., Healey, R. L., West, H. & Déry, C. (in press). Pedagogic partnership in higher education: Encountering emotion in learning and enhancing student wellbeing, *Journal of Geography in Higher Education*.
- Johnson, C. I., Bailey, S. K., & Van Buskirk, W. L. (2017). Designing effective feedback messages in serious games and simulations: A research review. In *Instructional Techniques to Facilitate Learning and Motivation of Serious Games* (pp. 119-140). Springer, Cham.
- Jossberger, H., Brand-Gruwel, S., Boshuizen, H., & Van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: A theoretical analysis and synthesis of requirements. *Journal of Vocational Education and Training, 62*(4), 415-440.
- Kirschner, P. A., Ayres, P., & Chandler, P. (2011). Contemporary cognitive load theory research: The good, the bad and the ugly. *Computers in Human Behavior, 27*(1), 99-105.

- Komarraju, M. (2013). Ideal teacher behaviors: Student motivation and self-efficacy predict preferences. *Teaching of Psychology, 40*(2), 104-110.
- Kocaman, G., Ugur, A., & Dicle, A. (2009). A longitudinal analysis of the self-directed learning readiness level of nursing students enrolled in a problem-based curriculum. *Journal of Nursing Education, 48*(5), 286-290.
- Krijgsman, C., Mainhard, T., van Tartwijk, J., Borghouts, L., Vansteenkiste, M., Aelterman, N., & Haerens, L. (2019). Where to go and how to get there: Goal clarification, process feedback and students' need satisfaction and frustration from lesson to lesson. *Learning and Instruction, 61*, 1-11.
- Lam, C. F., DeRue, D. S., Karam, E. P., & Hollenbeck, J. R. (2011). The impact of feedback frequency on learning and task performance: Challenging the "more is better" assumption. *Organizational Behavior and Human Decision Processes, 116*(2), 217-228.
- Lee, I. (2008). Student reactions to teacher feedback in two Hong Kong secondary classrooms. *Journal of Second Language Writing, 17*(3), 144-164.
- Loyens, S. M., Magda, J., & Rikers, R. M. (2008). Self-directed learning in problem-based learning and its relationships with self-regulated learning. *Educational Psychology Review, 20*(4), 411-427.
- Marsick, V. J., & Watkins, K. E. (2001). Informal and incidental learning. *New directions for adult and continuing education, 2001*(89), 25-34.
- Mayer, R. E., & Alexander, P. A. (Eds.). (2016). *Handbook of research on learning and instruction*. Taylor & Francis.

- McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research quarterly for exercise and sport*, *60*(1), 48-58.
- Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. *New directions for adult and continuing education*, *89*, 3-14.
- Moreno, R. (2004). Decreasing cognitive load for novice students: Effects of explanatory versus corrective feedback in discovery-based multimedia. *Instructional science*, *32*(1-2), 99-113.
- Narciss, S., & Huth, K. (2004). How to design informative tutoring feedback for multimedia learning. In H. M. Niegemann, D. Leutner, & R. Brunken (Ed.), *Instructional design for multimedia learning* (pp. 181–195). Munster, NY: Waxmann.
- Narciss, S., Sosnovsky, S., Schnaubert, L., Andrès, E., Eichelmann, A., Gogvadze, G., & Melis, E. (2014). Exploring feedback and student characteristics relevant for personalizing feedback strategies. *Computers & Education*, *71*, 56-76.
- Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in higher education*, *31*(2), 199-218.
- Orsmond, P., Maw, S. J., Park, J. R., Gomez, S., & Crook, A. C. (2013). Moving feedback forward: theory to practice. *Assessment & Evaluation in Higher Education*, *38*(2), 240-252.
- Oyserman, D., Coon, H. M., & Kimmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological bulletin*, *128*(1), 3.

- Park, O. C., & Lee, J. (2003). Adaptive instructional systems. *Educational Technology Research and Development, 25*, 651-684.
- Phye, G. D., & Sanders, C. E. (1994). Advice and feedback: Elements of practice for problem solving. *Contemporary Educational Psychology, 19*(3), 286-301.
- Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International journal of educational research, 31*(6), 459-470.
- Pridemore, D. R., & Klein, J. D. (1991). Control of feedback in computer-assisted instruction. *Educational Technology Research and Development, 39*(4), 27-32
- Saks, K., & Leijen, Ä. (2014). Distinguishing self-directed and self-regulated learning and measuring them in the e-learning context. *Procedia - Social and Behavioral Sciences, 112*, 190-198.
- Sales, G. C. (1993). Adapted and adaptive feedback in technology-based instruction. *Interactive instruction and feedback, 14*, 159-175.
- Salkind, N. J. (Ed.). (2010). *Encyclopedia of research design* (Vol. 3). SAGE publications.
- Sargeant, J., Mann, K., Sinclair, D., Van der Vleuten, C., & Metsemakers, J. (2008). Understanding the influence of emotions and reflection upon multi-source feedback acceptance and use. *Advances in Health Sciences Education, 13*(3), 275-288.
- Schwab, K., Moseley, B., & Dustin, D. (2018). Grading Grades as a Measure of Student Learning. *SCHOLE: A Journal of Leisure Studies and Recreation Education, 33*(2), 87-95.
- Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & writing quarterly, 23*(1), 7-25.

- Shute, V. J. (2008). Focus on formative feedback. *Review of educational research*, 78(1), 153-189.
- Song, S. H., & Keller, J. M. (2001). Effectiveness of motivationally adaptive computer-assisted instruction on the dynamic aspects of motivation. *Educational Technology Research and Development*, 49(2), 5–22.
- Sottolare, R. A., Burke, C. S., Salas, E., Sinatra, A. M., Johnston, J. H., & Gilbert, S. B. (2018). Designing adaptive instruction for teams: A meta-analysis. *International Journal of Artificial Intelligence in Education*, 28(2), 225-264.
- Timmers, C. F., Braber-Van Den Broek, J., & Van Den Berg, S. M. (2013). Motivational beliefs, student effort, and feedback behaviour in computer-based formative assessment. *Computers & education*, 60(1), 25-31.
- Triandis, H. C. & Gelfland, M. J. (1998). Converging measurement of horizontal and vertical individualism and collectivism. *Journal of Personality and Social Psychology*, 74, 118-128.
- Welsh, E. (2002, May). Dealing with data: Using NVivo in the qualitative data analysis process. *Forum Qualitative Social Research*, 3(2).
- Williamson, S. N. (2007). Development of a self-rating scale of self-directed learning. *Nurse researcher*, 14(2).
- Wilson, A., Watson, C., Thompson, T. L., Drew, V., & Doyle, S. (2017). Learning analytics: Challenges and limitations. *Teaching in Higher Education*, 22(8), 991-1007.
- Wulf, G., McConnel, N., Gärtner, M., & Schwarz, A. (2002). Enhancing the learning of sport skills through external-focus feedback. *Journal of motor behavior*, 34(2), 171-182

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, 41(2), 64-70.

Appendix A

Teachers' Protocol for Formulation of Feedback

In dit protocol wordt achtergrondinformatie gegeven over feedback, vervolgens wordt beschreven op welke manier feedback wordt gegeven voor de twee condities binnen het onderzoek.

Achtergrondinformatie over feedback

1. Het doel van feedback is het dichten van het gat tussen huidige en gewenste prestatie.
2. Feedback kan gegeven worden op vier niveaus:
 - **Taakniveau** - Feedback gericht op de correctheid van de uitvoering van een taak.
 - Voorbeeld: Het zou goed zijn als je nog informatie over X toevoegt.
 - **Procesniveau** - Feedback gericht op onderliggende processen bij het werken aan de taak.
 - Voorbeeld: Je kan dit beter volgens strategie Y doen.
 - **Zelfregulatie niveau** - Feedback gericht op metacognitieve vaardigheden – deze spoort de leerling aan om zichzelf te bevragen
 - Voorbeeld:
 - **Persoonsniveau** - Feedback gericht op de persoon die de taak uitvoert
 - Voorbeeld: Wat een slimme opmerking!
3. Effectieve feedback bestaat uit drie elementen
 - De doelen die de studenten moeten behalen voor het succesvol afronden van de opdracht (**feed-up**)
 - De huidige voortgang van studenten ten opzichte van het einddoel (**feed-back**)
 - De activiteiten die de student moet ondernemen voor betere voortgang (**feed-forward**)

Conditie A: Improvement-oriented feedback

In deze conditie zal de focus van de feedback liggen op het optimaliseren van de uitkomsten van taken waar de studenten mee bezig zijn geweest. Studenten krijgen informatie over de doelen van de opdracht middels een opdrachtbeschrijving en een beoordelingsformulier (feed-up). Er wordt een algemeen oordeel gegeven over de huidige prestatie (feed-back). Er zal geen gerichte informatie gegeven worden over het proces en de taken die de lerenden nog moeten vervullen. In plaats daarvan krijgen studenten aanknopingspunten voor het verbeteren van hun huidige werk (feed-forward). Voor deze conditie is voor alle vier de feedbackniveaus hieronder een voorbeeld gegeven.

Taakniveau: Het is belangrijk dat je in het theoretisch kader nog informatie toevoegt over economische consequenties van migrantenstromen vanuit het Midden-Oosten.

Procesniveau: Je kan voor het zoeken naar aanvullende literatuur voor je synthese het beste de volgende termen (X, Y, Z) gebruiken.

Zelfregulatie niveau: Welke informatie denk je nog aan deze alinea toe te moeten voegen voordat de lezer je tekst zal begrijpen?

Persoonsniveau: Deze zin heb je nog niet zo mooi opgeschreven.

Conditie B: Progression-oriented feedback

In deze conditie zal de focus van de feedback liggen op het optimaliseren van de doorstroom van de studenten door alle taken die ze af moeten ronden. Studenten krijgen informatie over de doelen van de opdracht middels een opdrachtbeschrijving en een beoordelingsformulier (feed-up). Er zal een algemeen oordeel gegeven worden over de huidige prestatie (feed-back), maar geen aanknopingspunten over hoe het huidige stuk verbeterd kan worden. In plaats daarvan ontvangen de studenten uitgebreide feedback over wat er vanaf nu tot het eind van de cursusperiode moet gebeuren om het paper af te ronden (feed-forward). Voor deze conditie is voor alle vier de feedbackniveaus hieronder een voorbeeld gegeven.

Taakniveau: Je zal (kijkend naar het maximale woordenaantal) ervoor moeten zorgen dat je vanaf nu niet teveel extra informatie toevoegt

Procesniveau: Bij het opstellen van je conclusie kun je elementen X en Y van je introductie gebruiken.

Zelfregulatie niveau: Hoe ga je ervoor zorgen dat je genoeg weet over dit thema om straks de conclusie op papier te zetten?

Persoonsniveau: Kijkend naar je huidige stuk verwacht ik dat het schrijven van de conclusie je geen moeite gaat kosten.

Appendix B

Self-Report Scale of Self-Directed Learning (SRSSDL)

Student number: _____

For each of the following statements, please indicate which answer fits best, using the following scale:

1 2 3 4 5
 Never Seldom Sometimes Often Always

1	Awareness	Score				
1.1	I identify my own learning needs	1	2	3	4	5
1.2	I am able to select the best method for my own learning	0	0	0	0	0
1.3	I consider teachers as facilitators of learning rather than providing information only	0	0	0	0	0
1.4	I keep up to date on different learning resources available	0	0	0	0	0
1.5	I am responsible for my own learning	0	0	0	0	0
1.6	I am responsible for identifying my areas of deficit	0	0	0	0	0
1.7	I am able to maintain self-motivation	0	0	0	0	0
1.8	I am able to plan and set my learning goals	0	0	0	0	0
1.9	I have a break during long periods of work	0	0	0	0	0
1.10	I need to keep my learning routine separate from my other commitments	0	0	0	0	0
1.11	I relate my experience with new information	0	0	0	0	0
1.12	I feel that I am learning despite not being instructed by a lecturer	0	0	0	0	0
2	Evaluation					
2.1	I self-assess before I get feedback from instructors	0	0	0	0	0
2.2	I identify the areas for further development in whatever I have accomplished	0	0	0	0	0
2.3	I am able to monitor my learning progress	0	0	0	0	0
2.4	I am able to identify my areas of strength and weakness	0	0	0	0	0
2.5	I appreciate when my work can be peer reviewed	0	0	0	0	0
2.6	I find both success and failure inspire me to further learning	0	0	0	0	0
2.7	I value criticism as the basis of bringing improvement to my learning	0	0	0	0	0
2.8	I monitor whether I have accomplished my learning goals	0	0	0	0	0
2.9	I review and reflect on my learning activities	0	0	0	0	0
2.10	I find new learning challenging	0	0	0	0	0
2.11	I am inspired by others' success	0	0	0	0	0
3	Interpersonal skills	0	0	0	0	0
3.1	I intend to learn more about other cultures and languages I am frequently exposed to	0	0	0	0	0
3.2	I am able to identify my own role within a group	0	0	0	0	0
3.3	My interaction with others helps me to develop the insight to plan for further learning	0	0	0	0	0
3.4	I make use of any opportunities I come across	0	0	0	0	0
3.5	I need to share information with others	0	0	0	0	0
3.6	I maintain good inter-personal relationships with others	0	0	0	0	0
3.7	I find it easy to work in collaboration with others	0	0	0	0	0
3.8	I am successful in communicating verbally	0	0	0	0	0
3.9	I identify the need for interdisciplinary links for maintaining social harmony	0	0	0	0	0
3.10	I am able to express my ideas effectively in writing	0	0	0	0	0
3.11	I am able to express my views freely	0	0	0	0	0
3.12	I find it challenging to pursue learning in a culturally diverse milieu	0	0	0	0	0

INTRINSIC MOTIVATION INVENTORY (Post-intervention)

Student number: _____

For each of the following statements, please indicate how true it is for you, using the following scale:

1 2 3 4 5 6 7
 Not at all Somewhat Very true
 true true

#	Statements	1	2	3	4	5	6	7
1	I did not feel at all nervous about doing the assignment	0	0	0	0	0	0	0
2	I felt like it is my choice to do this assignment	0	0	0	0	0	0	0
3	I think I am pretty good at this assignment	0	0	0	0	0	0	0
4	I found the assignment very interesting	0	0	0	0	0	0	0
5	I felt tense tense while working on this assignment	0	0	0	0	0	0	0
6	I think I did pretty well at this assignment, compared to other students	0	0	0	0	0	0	0
7	Doing this assignment was fun	0	0	0	0	0	0	0
8	I felt relaxed while doing the task	0	0	0	0	0	0	0
9	I enjoyed doing this task very much	0	0	0	0	0	0	0
10	I did not really have a choice about doing this assignment	0	0	0	0	0	0	0
11	I was anxious while doing the assignment	0	0	0	0	0	0	0
12	I thought the assignment was very boring	0	0	0	0	0	0	0
13	I felt like I was doing what I wanted to do while I was working on the assignment	0	0	0	0	0	0	0
14	I felt pretty skilled at this task	0	0	0	0	0	0	0
15	I thought the task was very interesting	0	0	0	0	0	0	0
16	I felt pressured while doing the task	0	0	0	0	0	0	0
17	I felt like I had to do the task	0	0	0	0	0	0	0
18	I did this task because I had no choice	0	0	0	0	0	0	0

Appendix D

Questionnaire On Cultural Tendencies

Student number: _____

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

#	Statements	1	2	3	4	5	6	7
1	I'd rather depend on myself than on others	0	0	0	0	0	0	0
2	Winning is everything	0	0	0	0	0	0	0
3	To me, pleasure is spending time with others	0	0	0	0	0	0	0
4	It is important to me that I respect the decisions made by my groups	0	0	0	0	0	0	0
5	I rely on myself most of the time; I rarely rely on others	0	0	0	0	0	0	0
6	Competition is the law of nature	0	0	0	0	0	0	0
7	I feel good when I cooperate with others	0	0	0	0	0	0	0
8	Parents and children must stay together as much as possible	0	0	0	0	0	0	0
9	I often do 'my own thing'	0	0	0	0	0	0	0
10	When another person does better than I do, I get tensed and aroused	0	0	0	0	0	0	0
11	If a coworker gets a prize, I would feel proud	0	0	0	0	0	0	0
12	It is my duty to take care of my family, even when I have to sacrifice what I want	0	0	0	0	0	0	0
13	My personal identity, independent of others, is very important to me	0	0	0	0	0	0	0
14	It is important that I do my job better than others	0	0	0	0	0	0	0
15	The well-being of my coworkers is important to me	0	0	0	0	0	0	0
16	Family members should stick together, no matter what sacrifices are required	0	0	0	0	0	0	0

Appendix E

Interview topics

Topic 1: Self-regulation and developments in self-directed learning within the course assignment

1.1 Forethought

- Hoe wilde je het schrijven van het paper in eerste instantie aanpakken?
- Hoe ben je tot deze aanpak gekomen?
- Ben je, terugkijkend vanuit het eindresultaat, tot nieuwe inzichten gekomen wat betreft de juiste aanpak van het paper? Welke? Ga je dit in de toekomst anders doen?
- Heb je dit paper in vergelijking met andere opdrachten anders aangepakt?
 - o Waarom?
- Wat waren je verwachtingen over je prestatie op dit paper?
- Hoe belangrijk was het goed afronden van dit paper voor jou?
 - o Waarom?

1.2 Performance

- Heb je je aanpak (zoals hierboven besproken) gedurende het proces veranderd?
 - o Waarom heb je besloten de aanpassingen te doen?
- Hoe ging het schrijfproces?
- Wat vond je van de groepsamenwerking?
 - o Wat heb jij gedaan om het proces in goede banen te leiden?
- Wat ging er niet volgens planning, en hoe is dit opgelost?
- Hoe kijk je terug op de uitvoering van je paper?
- Wat neem je mee vanuit het proces?
- Heb je in het proces dingen anders gedaan dan normaal/bij vergelijkbare opdrachten?
 - o Waarom?

1.3 Reflection

- Wat vind je van de kwaliteit van het uiteindelijk paper?
 - o Waarom vind je dat?
 - (Is deze onderbouwing anders dan hoe je normaal je evaluatie onderbouwt?)
- Hoe staat deze prestatie in verhouding met je eerdere prestaties?
- Zijn er dingen die je in de toekomst anders zou willen aanpakken?
 - o (Op welke manier) heb je dat gedeeld met de groep? Hoe ging dat?
 - o Hoe groot acht je de kans dat je je aanpak op die manier gaat veranderen?
 - Waarom?
- Zijn er externe factoren geweest die invloed hebben gehad op het eindresultaat?

Topic 2: Impact of feedback on developments in self-regulation

2.1 Feelings towards the feedback

- Wat vond je van de feedback?
 - o Compleetheid? Correctheid? Passendheid? Was je het er meer eens?

- Waarom vind je dat?

2.2. Use of feedback

- Wat heb je gedaan met de feedback?
 - Heb je je strategie aangepast?
 - Heb je inhoudelijke dingen veranderd?
 - Zijn er zaken uit de feedback die je bewust niet hebt meegenomen? Waarom niet?

2.3 Influence of feedback

- Wat heb je geleerd van de feedback?
 - Neem je iets mee naar toekomstige papers?
- Hoe heeft de feedback nog meer invloed gehad?
 - Op jezelf
 - Op het paper
 - Op de groep
- Denk je dat de manier waarop feedback gegeven is wel of niet heeft bijgedragen aan jouw prestatie?
 - Welke elementen van feedback waren hierin bepalend?
- Denk je dat de manier waarop feedback gegeven is wel of niet heeft bijgedragen aan jouw kennisverwerving?
 - Welke elementen van feedback waren hierin bepalend?
- Denk je dat de manier waarop feedback gegeven is wel of niet heeft bijgedragen aan hoe jij leeractiviteiten gaat aanpakken?
 - Welke elementen van feedback waren hierin bepalend?

2.4. Other factors that might have influenced the impact of feedback results

- Heb je buiten de feedback nog om andere informatie gevraagd?
 - Aan wie?
 - Wat heb je toen aan informatie gekregen?
- Heb je alle feedbacksessies bijgewoond? Alle feedback ontvangen?

Teacher interview:

1. Discuss remarkable findings from data analyses and student interviews
2. Discuss the intervention from the teacher's perspective
 - a. Delivering the intervention
 - b. Student reactions and developments
 - c. Consequences for education
 - d. Unexpected events

Appendix F

Information letter + Informed consent

Information letter for participants

Dear student,

Who am I?

My name is Maartje Körner, master's student Educational Sciences at Utrecht University. I am conducting research for my master's thesis, supervised by dr. Gemma Corbalan.

What is the purpose of this study?

This study attempts to find out if adjustments in feedback specificity cause changes in developments of students' self-directed learning skills. Self-directed learning skills refer to the extent in which a student is capable of making correct decisions and monitoring itself adequately.

What does the research entail?

Within this course, you will receive feedback from your teacher on a written assignment. Depending on the feedback condition you will be assigned to, the feedback will contain different elements. For participation, you need to fill in a questionnaire on demographics, motivation and self-directed learning skills. After handing in the assignment, you will fill these questionnaires again. The completion of questionnaires will take around 15 minutes.

Privacy and security

All data will be handled with the greatest caution. Any personal information that could reasonably identify you will be removed or changed before files are shared with other researchers or results are made public. The principal investigator will keep a link that identifies you to your coded information, but this link will be kept secure and available only to the principal investigator. The data will be used solely for the purpose of research and education. Your teacher will not have access to the answers to your questionnaires.

Possibility to ask questions, information and consent

Questions about the research can be directed to Maartje Körner (m.a.j.korner@uu.nl). Further questions about the course for which I conduct this research can be addressed to Gemma Corbalan (g.corbalan@uu.nl).

Please fill in the form on the back of this paper. You can hand the form to the researcher.

Best regards,

BSc Maartje Körner

INFORMED CONSENT

For participation in scientific research

I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

 I will participate in this study

Please tick the statement that applies

 I will not participate in this study

Name :

Student number :

Date :

Signature :

If you would like to receive information on the results of this study, please fill in your email address here: _____

Appendix G

Data Management Plan

DATA MANAGEMENT PLAN MASTER'S THESIS

A Data Management Plan created using DMPonline

Creator: Maartje Körner

Affiliation: Utrecht University

Template: Utrecht University

Last modified: 24-01-2019

DATA MANAGEMENT PLAN MASTER'S THESIS**PREPARE: DATA COLLECTION****1.1. Will you use existing data?**

☒ No. Please specify in comment why existing data is not sufficient for your research.

A review of the literature shows no available data on the effects of feedback specificity for development of student self-directed learning skills.. Gathering primary data is needed to answer the research question.

1.2. What data will you collect or create?

Give a brief description of the data, including the type, volume (if known), format and content. If possible, give a rough estimate of the number of files.

Data will include filled-in questionnaires on self-directed learning scales, filled-in questionnaires on intrinsic motivation, data on learner characteristics (gender, cultural background, proficiency), transcripts of written feedback, audio recordings of interviews with teachers and students, transcriptions of interviews with students and teachers. Transcriptions and teacher gradings will be .txt format, audio recordings will be .wmv format, questionnaires will be .sav format.

1.3. How will the data be collected or created?

Briefly describe the research methodologies used and how you will ensure data quality.

Data on motivation and self-directed learning skills of Dutch participants above the age of 18 will be collected using printed out standardised questionnaires. Questionnaires will be distributed and collected in a tutorial session, where the researcher will be present to answer questions. All participants fill in the questionnaires simultaneously. Semi-structured interviews will be conducted by the researcher in a systematic manner. Standards on transcriptions and interviews will be covered in an interview protocol, that will be developed by the researcher after quantitative data collection has started.

1.4. How will you manage rights issues?

State who will own the copyright and intellectual property rights (IPR) on any data that you will collect or create, along with the agreements you made for its use and reuse.

Intellectual Property Rights are covered in the consortium agreement.

1.5 What are the costs involved in managing and storing your data?

There may be costs involved in acquiring, managing and storing your data. Specify these costs here.

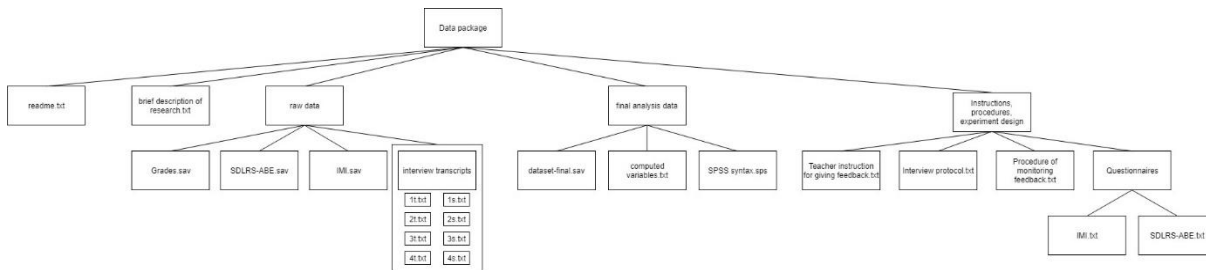
There are no costs involved in acquiring, managing and storing of the data.

PREPARE: DATA DOCUMENTATION

2.1. How will you structure your data?

Describe your intended folder structure, and file naming conventions.

Intended folder structure and file naming conventions are shown in the image below.



2.2. How do you handle version control?

Describe how you will keep track of changes to your research data.

Changes in research data will be tracked through adding a code after each edit (for example V1.2, where the first number indicates major versions with significant change, and the last number is used for minor versions). When updating a file, the last copy is used as a source, and will be saved with the new version code in the filename before any editing takes place. Changes between listed versions will be described briefly in a separate version document.

2.3. How will the data be described and documented?

Briefly describe how peers should be able to understand your data.

A file containing instructions, procedures, and experiment design will be included in the data package. A file containing 'readme style' metadata will guide peers through the data package. Metadata standard formulated at datadryad.org will be consulted to ensure this file will provide peers with sufficient information.

HANDLE: DATA STORAGE

3.1. Where will you store your data?

List the locations where your data will be stored, and indicate if storage capacity is sufficient.

The raw, anonymised research data from this project will be deposited with the faculty server, to ensure long-term access for the research community. Data that can be traced to the individual are stored separately from raw data on the U-drive of the researcher. Research data will be deposited shortly after the final acceptance of the manuscript.

3.2. How will the data be backed up?

Describe your backup strategy or the automated backup strategy of your storage locations.

My data will be backed up to my hard drive once a day (or after data has been changed), and once a week to a USB drive. This way, loss of data will be limited and files can be restored to reasonably recent versions in case of hardware failures.

HANDLE: DATA SECURITY**4.1. Will you use or collect any confidential or privacy-sensitive data?**

☒ Yes > Please continue to question 4.2 and omit 4.3 to continue to question 4.4.

Yes

4.2. How will you handle confidential or privacy-sensitive data?

Explain what actions you will pursue to safeguard the privacy of persons involved in your research or to protect the confidentiality of your data. Make sure to consider transparency, data minimisation and purpose, storage, and access limitation as appropriate measures.

Active informed consent of all participants is obtained before the data collection period starts. Only strictly necessary personal data will be collected, which will be the following information:

- Student numbers
- Gender
- GPA
- Culture Orientation

Identifying information will be anonymised at the earliest possible point. Data will not be stored with the remaining identifiable information unencrypted unless in secure environments. The key to encrypted information is known to the project members and is stored elsewhere from the encrypted data.

4.3. What measures will you take to comply with security requirements and mitigate risks?

Consider necessary measures for the availability, integrity and confidentiality (authorisation of access) of your data.

4.4. To whom will access be granted/restricted?

Please describe who will have access, when and to what parts of your data. Also mention who has authority to grant access. Note: this is during research. Access after research is included in part 6.

Access to the data will be restricted to the researcher and the supervisor. The key to the identifiable data will be accessed only by the researcher (M.A.J. Körner).

PRESERVE AND SHARE: DATA SELECTION AND PRESERVATION**5.1. Which data should be preserved and/or shared?**

Describe the content of the data package you will preserve for the long term and indicate how it will be possible to reproduce your findings.

The data package will contain: the methods and materials to collect the data, the raw data, the script to come to processed data, the processed data, the scripts leading to tables and figures in the publication, a codebook with explanations on the variable names, a 'read me' text with an overview of files included and their content and use. To make sure that privacy-sensitive data stays protected, only interview transcripts will be stored. Audio files will not be saved to the faculty server.

5.2. How and where will you keep your data for the long term?

Explain where you will preserve your data, and how procedures are applied to ensure the survival of the data for the long term

The data will be stored at the faculty data server for at least 10 years. The data is accessible by issuing a request to the faculty data manager. Data can be obtained by anyone, only for the purpose of verifying the publication that was based on this. A data use agreement has been set up to formalize this. The use of the faculty data server for archiving is free of charge for researchers of the faculty

PRESERVE AND SHARE: DATA AVAILABILITY FOR REUSE

6.1. What secondary use of your data is intended or foreseeable?

Explain what reuse of your research data you intend or foresee, and what audience will be interested in your data. This will help you decide what data you will make available for reuse, where you will make the data available and how.

The research data will be of interest to researchers and practitioners working in the field of Educational Sciences, specifically in the fields of self-directed learning and adaptive instruction. Raw or processed data and study results will be useful for others to compare effect sizes, design new experiments and adapt practices.

6.2. Where will you make your data available?

Explain where you will make your data findable and available to others.

I will publish my data in the faculty server.

6.3. What access and usage conditions will apply?

State when your data will be available for reuse. Also specify if any restrictions or special conditions apply in accessing or using your data. State the kind of license or usage agreement you will use for your data.

The descriptive metadata will be published in the data repository, with a description of how a data request can be made.

Appendix H

FETC form

APPLICATION FORM FOR THE ASSESSMENT OF A RESEARCH PROTOCOL BY THE FACULTY ETHICS REVIEW BOARD (FERB) OF THE FACULTY OF SOCIAL AND BEHAVIOURAL SCIENCES**General guidelines for the use of this form**

1. This form can be used for a single research project or a series of related studies (hereinafter referred to as: "research programme"). Researchers are encouraged to apply for the assessment of a research programme if their proposal covers multiple studies with related content, identical procedures (methods and instruments) and contains informed consent forms and participant information, with a similar population. For studies by students, the FERB recommends submitting, in advance, a research programme under which protocol multiple student projects can be conducted so that their execution will not be delayed by the review procedure. The application of such a research programme must include a proper description by the researcher(s) of the programme as a whole in terms of the maximum burden on the participants (e.g. maximum duration, strain/efforts, types of stimuli, strength and frequency, etc.). If it is impossible to describe all the studies within the research programme, it should, in any case, include a description of the most invasive study known so far.
2. Solely the first responsible senior researcher(s) (from post-doctoral level onwards) may submit a protocol.
3. Any approval by the FERB is valid for 5 years or until the information to be provided in the application form below is modified to such an extent that the study becomes more invasive. For a research programme, the term of validity is 2 years and any extension is subject to approval. The researcher(s) and staff below commit themselves to treating the participants in accordance with the principles of the Declaration of Helsinki and the Dutch Code of Conduct for Scientific Practices as determined by the VSNU Association of Universities in the Netherlands (which can both be downloaded from the FERB site on the Intranet¹) and guarantee that the participants (whether decisionally competent or incompetent and/or in a dependent relationship vis-a-vis the researcher or not) may at all times terminate their participation without any further consequences.
4. The researcher(s) commit themselves to maximising the quality of the study, the statistical analysis and the reports, and to respect the specific regulations and legislation pertaining to the specific methods.
5. The procedure will run more smoothly if the FERB receives all the relevant documents, such as questionnaires and other measurement instruments as well as literature and other sources on studies using similar methods which were found to be ethically acceptable and that testify to the fact that this procedure has no harmful consequences. Examples of studies where the latter will always be an issue are studies into bullying behaviour, sexuality, and parent-child relationships. The FERB asks the researcher(s) to be as specific as possible when they answer the relevant questions while limiting their answers to 500 words maximum per question. It is helpful to the FERB if the answers are brief and to the point.
6. **Our FAQ document that can be accessed through the Intranet provides background information with regards to any questions.**
7. The researcher(s) declare to have described the study truthfully and with a particular focus on its ethical aspects.

¹ See: <https://intranet.uu.nl/facultaire-ethische-toetsingscommissie-fetc>

Signed for approval²:

Date:

² The senior researcher (holding at least a doctoral degree) should sign here.

A. GENERAL INFORMATION/PERSONAL DETAILS

1.

a. Name(s), position(s) and department(s) of the responsible researcher(s):

Maartje Körner, Master's student Educational Sciences, department of Educational Sciences

b. Name(s), position(s) and department(s) of the executive researcher(s):

Dr. Gemma Corbalan, department of Educational Sciences

2. Title of the study or research programme - Does it concern a single study or a research programme? Does it concern a study for the final thesis in a bachelor's or master's degree course?:

Master's thesis Educational Sciences

3. Type of study (with a brief rationale):

This study will be carried out with a mixed methods design, integrating quantitative and qualitative data. This method is chosen because it allows the research question to be answered more in-depth and from different angles. Semi-structured interviews with students and teachers will help interpreting the quantitative results. Additionally, interviews can provide insights on short-term changes in SDL-skills, as self-directed learning is a hard to measure concept and changes in SDL-skills take time before becoming noticeable (Kocaman, Ugur & Dicle, 2009).

4. Grant provider:

Not applicable

5. Intended start and end date for the study:

February – mid June

6. Research area/discipline:

Educational Sciences: Cognition, Learning & Instructional Design

7. For some (larger) projects it is advisable to appoint an independent contact or expert whom participants can contact in case of questions and/or complaints. Has an independent expert been appointed for this study?³

Yes, dr. Gemma Corbalan

8. Does the study concern a multi-centre project, e.g. in collaboration with other universities, a GGZ mental health care institution, a university medical centre? Where exactly will the study be conducted? By which institute(s) are the executive researcher(s) employed?:

No

9. Is the study related to a prior research project that has been assessed by a recognised Medical Ethics Review Board (MERB) or FERB?

No

If so, which? Please state the file number:

B. SUMMARY OF THE BACKGROUND AND METHODS

Background

1. What is the study's theoretical and practical relevance? (500 words max.):

Self-directed learning skills (SDL-skills) refer to learners' ability to direct the conceptualization, design, conduct and evaluation of their own learning (Brookfield, 2009). Growing attention has been given to the development of SDL-skills (Bonk, Lee, Kou, Xu & Sheu, 2015). One of the reasons for this interest is the implementation of 'lifelong learning'-policies in the workplace, that rely heavily on the ability employees have to direct themselves in their learning processes. To facilitate the transition of students into the workplace and its demands, it is important to investigate facilitators and inhibitors of SDL-skills in learning contexts (Dunlap & Grabinger, 2003).

Feedback has shown to improve students' self-regulation (Butler & Winne, 1995; Hattie & Timperley, 2007). It is therefore useful to investigate how feedback might impact learners' self-directed learning behavior. The specificity of feedback is defined as 'the amount of information on responses beyond their accuracy' (Goodman, Wood & Hendrickx, 2004). There is no consensus on the optimal specificity of feedback (Krijgsman et al., 2019). Since specific feedback tends to be more directive than facilitative (Shute, 2008), it could be argued that less specific feedback helps experienced learners to practice their SDL-skills, by giving them more control over the management of their learning trajectory. This argument is supported by findings of Goodman et al. (2004), who found that students receiving highly specific feedback were less able to respond to poor performance. This was partly because they did not practice with responses for these situations as the feedback continuously guided them to the correct behavior.

³ This contact may, in principle, also be a researcher (within the same department, or not) who is able to respond to the question or complaint in detail. Independent is to say: not involved in the study themselves. The FERB upholds that an independent contact is not obligatory, but will be necessary when the study is more invasive.

A yet-to-be researched topic is the effects of specificity of feed-forward messages on students SDL-skill development. Feed-forward has strong directive properties, as it provides the learner with clues for further action (Orsmond, Maw, Park, Gomez & Crook, 2013). As information in feed-forward goes beyond whether student output is correct or incorrect, including it in feedback messages will increase feedback specificity. Therefore, it could be expected that limiting information in feed-forward messages may lead to developments in SDL-skills of experienced learners, by increasing the control a student has for managing their learning trajectories. Feed-forward information can be divided into two categories: information on actions required to improve the current output, and information on actions required to effectively progress from the current output to subsequent tasks (Hattie & Timperley, 2007). When restricting the information to one of the two categories, feed-forward specificity can be limited. To be able to determine how feedback specificity can best be limited for the improvement of SDL-skills.

There are a lot of inconsistencies in effect findings of feedback studies (Hattie & Timperley, 2007), which might be because the effects of feedback strongly depend on the characteristics of the receiver of feedback (Narciss & Huth, 2004). As these differences may affect results of the feedback intervention, this study will also investigate possible influences of students' individual characteristics on feedback effects

2. What is the study's objective/central question?:

How does manipulating feed-forward specificity influence learners' development of self-directed learning skills?

3. What are the hypothesis/hypotheses and expectation(s)?:

Hypotheses are:

- Students in Condition A specificity will show different developments in self-directed learning skills than students in Condition B
- Students in both condition will show developments in SDL-skills
- Higher student motivation will increase students' self-directed learning skills for both specificity conditions
- Students' gender will influence the effect of feedback specificity on development of self-directed learning skills
- Students' cultural orientation will influence the effect of feedback specificity on development of self-directed learning skills
- Students' proficiency will influence the effect of feedback specificity on development of self-directed learning skills

Design/procedure/invasiveness

4. What is the study's design and procedure? (500 words max.):

This study will be carried out with a mixed methods design, integrating quantitative and qualitative data. This method is chosen because it allows the research question to be answered more in-depth and from different angles. Semi-structured interviews with students and teachers will help interpreting the quantitative results. Additionally, interviews can provide insights on short-term changes in SDL-skills, as self-directed learning is a hard to measure concept and changes in SDL-skills take time before becoming noticeable (Kocaman, Ugur & Dicle, 2009).

Before the intervention period, a protocol for formulating feedback for both conditions was developed together with the teacher (see Appendix A). In the second tutorial group, participants will fill in informed consent forms (see Appendix E). Once informed consent has been given, answers on IMI, SRSSDL, and COS questionnaires and demographic data will be collected. Optimal feedback frequency has been studied in the context of psychomotor skills (e.g. Wulf, McConnel, Gärtner, & Schwarz, 2002), where results indicate that receiving feedback in 50% of the learning sessions resulted in the best learning outcomes (Hemayattalab & Rostami, 2010). How this relates to cognitive learning tasks has yet to be researched, but since it has been established that a high frequency of feedback will be detrimental for learning (Lam, DeRue, Karam & Hollenbeck, 2011), feedback sessions will be scheduled in half of the tutorials. In the second, fifth and sixth week of the intervention period, participants will receive feedback according to their assigned condition. To monitor adherence of the teacher to the feedback protocol, a log book with information of the given feedback will be kept.

After the intervention period, IMI and SRSSDL questionnaires are administered again. The teacher will be asked to participate in a semi-structured interview, covering his experiences during the intervention period and their perceptions of the development in student output. Possible external factors that could have influenced results will also be discussed in this interview. Additionally, at least four students from each condition will be interviewed. Data will be processed as described in the data management plan (Appendix F).

5.

a. Which measurement instruments, stimuli and/or manipulations will be used?⁴

Instruments:

Self-Directed Learning-skills will be measured with a modified version of the Self Rating Scale of Self-Directed Learning (SRSSDL) (Williamson, 2007). The original instrument consists of 60 items with six subscales: awareness, learning strategies, learning activities, evaluation and interpersonal skills. Cronbach's alpha of the subscales ranges between .71 and .79, providing support for its reliability. For this study, the subscales learning strategies and learning activities are excluded, as

⁴ Examples: invasive questionnaires; interviews; physical/psychological examination, inducing stress, pressure to overstep important standards and values; inducing false memories; exposure to aversive materials like a unpleasant film, video clip, photos or electrical stimulus; long-term of very frequent questioning; ambulatory measurements, participation in an intervention, evoking unpleasant psychological or physical symptoms in an experiment, denial, diet, blood sampling, fMRI, TMS, ECG, administering stimuli, showing pictures, etc. In case of the use of a device (apparatus) or administration of a substance, please enclose the CE marking brochure for the relevant apparatus or substance, if possible.

there is no indication to expect learning strategies or activities to change during the learning trajectory. Changes in strategies might happen in future learning tasks as a result of changes in reflection, which will be measured through the evaluation scale. The instrument is included in Appendix B.

Semi-structured interviews will explore consequences of the intervention on SRL-activities and generalizations for the self-direction of the learning trajectory more in-depth. Students will be asked to compare their actions in the forethought, performance and reflection phases during this assignment with actions in previous assignments. Explanations for eventual changes will be discussed. Students will also be asked how the feedback might influence future learning strategies.

Motivation will be measured using a modified version of the task evaluation questionnaire, consisting of items of the Intrinsic Motivation Inventory (IMI) that are adapted to fit the purpose of the current research. This instrument assesses students' interest and enjoyment, perceived competence, pressure/tension and perceived choice on a specific task. There is strong support for validity of the scale (McAuley, Duncan, & Tammen, 1989). A Cronbachs alpha of .82 has been reported, providing support for its reliability (Tsigilis, & Theodosiou, 2003). IMI items can be modified slightly to fit specific activities. In this study, all items of the task evaluation questionnaire that could be formulated to be used as both pre- and post-measures are included. Two separate questionnaires with different formulations of the same 18 items will be used. Regarding the pre-test measurement, participants will be asked about how motivated they expect to be when working on the task (e.g. 'I think doing this assignment will be fun'), whereas the post-test questions will evaluate the level of motivation participants experienced during the task (e.g. 'Doing this assignment was fun'). Both questionnaires are included in Appendix C.

Learners' culture orientation will be measured with the Culture Orientation Scale (COS; Triandis & Gelfland, 1998). This 16-item questionnaire measures both collectivism and individualism on two dimensions: vertical (the extent to which a person is willing to accept hierarchy/inequality) and horizontal (the extent to which a person perceives equality as ideal/current reality), resulting in four subscales. There is support for the validity of the scale (Oyserman, Coon & Kimmelmeier, 2002; Gudykunst & Lee, 2003). Cronbach's alpha for the scales ranges between .73 and .82 (Cozma, 2011), providing evidence for its reliability. The instrument is included in Appendix D.

Information on gender (male/female/other) will be obtained through a separate question in pretest measures. Proficiency scores, as an indication of a learners' academic ability (Lee, 2008), will be measured by asking students to report their weighted average grade for the master's programme.

Manipulation:

The feedback formulation is manipulated for this thesis. To make sure the quality of feedback for students in both conditions is sufficient, feedback will be formulated according to guidelines described by Hattie & Timperley (2007). This means that the teacher adheres to three rules: Firstly, regardless of the feedback condition, the goal of the feedback will be to close the gap between current and desired performance. Secondly, whenever possible, feedback information will be given at a combination of the task-, process-, self-regulation- and self-levels. Thirdly, students will receive information on the goals of the assignment through a course manual, they will receive information

on their current position in relation to these goals, and they will receive information on how to progress. This final element, information on how to progress – also known as feed-forward, will differ between the two conditions. Participants in Condition A will only receive information on actions that can be undertaken to improve current outcomes, while participants in Condition B will only receive information on how to effectively progress from their current position to subsequent tasks. Examples of feedback messages for both conditions can be found in the feedback protocol (see Appendix A).

b. What does the study's burden on the participants comprise in terms of time, frequency and strain/efforts?:

The burden on the participants will consist of approximately 30 minutes of filling in questionnaires, 15 minutes before the start of a course and 15 minutes at the end of a course. Randomly selected participants will be asked to take part in a semi-structured interview with a duration of 1 hour after the course has ended.

c. Will the participants be subjected to interventions or a certain manner of conduct that cannot be considered as part of a normal lifestyle?:

No

d. Will unobtrusive methods be used (e.g. data collection of uninformed subjects by means of observations or video recordings)?:

No

e. Will the study involve any deception? If so, will there be an adequate debriefing and will the deception hold any potential risks?:

No

6. Will the participants be tested beforehand as to their health condition or according to certain disorders? Are there any inclusion and/or exclusion criteria or specific conditions to be met in order for a participant to take part in this study?:

No

7. Risks for the participants

a. Which risks does the study hold for its participants?

Risks for the participants are minor negative influences on short-term learning outcomes. There is no indication to believe the manipulation will cause any long-term negative consequences for learning.

b. To what extent are the risks and objections limited? Are the risks run by the participants similar to those in daily life?

Risks on performance are limited by making sure students in both conditions receive feedback containing all necessary elements for effectiveness (based upon a literature review). These elements are specified in a feedback protocol (Appendix A), containing guidelines for giving feedback in both conditions. Adherence to the protocol will be checked by the researcher after every feedback session, if deviations occur or elements are missing, the teacher will be informed and instructed to give the missing information to learners. This limits possible risks on learning for the participants as much as possible.

8. How does the burden on the participants compare to the study's potential scientific contribution (theory formation, practical usability)?:

The burden on participants regarding the development of SDL-skills and learning outcomes is necessary to test the hypotheses of the study. To determine how adapting feed-forward specificity may increase SDL-skills, different conditions have to be compared. This will provide fruitful information for the development of adaptive control systems, which will probably be seen more in future learning environments.

9. Will a method be used that may, by coincidence, lead to a finding of which the participant should be informed?⁵ If so, what actions will be taken in the case of a coincidental finding?:

No

Analysis/power

10. How will the researchers analyse the data? Which statistical analyses will be used?:

To answer the main research question, an ANOVA will be conducted using SPSS statistics. Specificity of feedback will be the independent variable, self-directed learning skills will be the dependent variable.

To investigate whether individual characteristics might have influenced the feedback effects, this analysis will be followed by an ANCOVA, with feedback specificity as independent variable, and self-directed learning skills as dependent variable, and the four learner characteristics (gender, proficiency, motivation, and cultural background) included as covariates. The outcomes of this analysis will serve as input for student interviews.

11. What is the number of participants? Provide a power analysis and/or motivation for the number of participants. The current convention is a power of 0.80. If the study deviates from this power, the FERB would like you to justify why this is necessary:

For a power of 0.80, a sample of 53 is needed. Estimated effect size is based upon similar studies investigating feedback specificity. This number is calculated using the algorithm of Borm, Fransen & Lemmens (2007).

C. PARTICIPANTS, RECRUITMENT AND INFORMED CONSENT PROCEDURE

1. The nature of the research population (please tick):

⁵ For instance: dementia, dyslexia, giftedness, depression, extremely low heartbeat in an ECG, etc. If coincidental findings may be found, this should be included in the informed consent, including a description of the actions that will be taken in such an event.

1. General population without complaints/symptoms**2. General population with complaints/symptoms****3. Patients or population with a diagnosis (please state the diagnosis)****2. Age category of the participants (please tick):**

- **18 years or older**
- **16-17 years**
- **13-15 years**
- **12 years or younger**

3. Does the study require a specific target group? If so, justify why the study cannot be conducted without the participation of this group (e.g. minors):

Yes, participants need to be in a masters' programme. The term self-directed learning was coined by Malcolm Knowles in 1975, who described it as a process relevant in adult education (Merriam, 2001). Over the years, the concept showed up in different contexts, no longer restricting itself to adult learners. Although the concept can be studied in varying samples, studying the development of SDL-skills in older students will generate especially useful results, as they will soon make the transition into the workplace that demands a certain level of SDL-skills.

4. Recruitment of participants -**a. How will the participants be recruited?**

Participants will be recruited through a briefing during the first tutorial session, in accordance with the course coordinator of the course in which data will be gathered.

b. How much time will the prospective participants have to decide as to whether they will indeed participate in the study?

Participants will be briefed about the study at the start of the second tutorial, and will have until the end of the tutorial to decide if they want to participate. Decision time will be 1,5 hours.

5. Does the study involve informed consent or mutual consent? Clarify the design of the consent procedure (who gives permission, when and how). Does the study involve active consent or passive consent? If no informed consent will be sought, please clarify the reason:

The study involves informed consent. Consent forms including information on the study will be distributed in the second tutorial session after the briefing on the research. They will be filled in by all students and collected at the end of the tutorial. The researcher will be present to answer questions about the study and participation.

6. Are the participants fully free to participate and terminate their participation whenever they want and without stating their grounds for doing so?:

Yes

7. Will the participants be in a dependent relationship with the researcher?:

No

8. Compensation

- a. Will the participants be compensated for their efforts? If so, what is included in this recompense (financial reimbursement, travelling expenses, otherwise). What is the amount?

No

- b. Will this compensation depend on certain conditions, such as the completion of the study?

No

D. PRIVACY AND INFORMATION

- a. Will the study adhere to the requirements for anonymity and privacy, as referred to in the Faculty Protocol for Data Storage⁶?:
- anonymous processing and confidential storage of data (i.e. storage of raw data separate from identifiable data): **yes/no**
 - the participants' rights to inspect their own data: **yes/no**
 - access to the data for all the researchers involved in the project: **yes/no**

If not, please clarify.

- b. Has a Data Management Plan been designed?

Yes, see Appendix F

2.

- a. Will the participant be offered the opportunity to receive the results (whether or not at the group level)?:

Yes, at the group level

- b. Will the results of the study be fed back to persons other than the participants (e.g. teachers, parents)?:

Yes, to teachers and the supplier of the feedback tool

If so, will this feedback be provided at the group or at the individual level?

Group level

⁶ This can be found on the Intranet: <https://intranet.uu.nl/wetenschappelijke-integriteit-facultair-protocol-dataopslag>

3.

- a. Will the data be stored on the faculty's data server?**yes/no**

- b. Will the data that can be traced back to the individual be stored separately on the other faculty server available for this specific purpose?

Yes

If not, please clarify where will the data be stored instead?:

E. ADDITIONAL INFORMATION

Optional.

-

F. FORMS TO BE ENCLOSED (CHECKLIST)

- Text (advert) for the recruitment of participants (attached below)
- Information letter for participant (Appendix F)
- Informed consent form for participants (Appendix F)
- Written or oral feedback information (debriefing text) (Not applicable)
- (Descriptions of) questionnaires (Appendices B, C, D)
- (Descriptions of) measurement instruments/stimuli/manipulations (Appendix A)
- Literature/references (See above)

Signature(s):⁷

Date and place:

Name, position:

⁷ The senior researcher (holding at least a doctoral degree) should sign here.

Text for the recruitment of participants

Beste [____]

Mijn naam is Maartje Körner, ik studeer Educational Sciences aan de Universiteit Utrecht. Op dit moment ben ik op zoek naar een sample voor mijn masterthesis over adaptieve feedback. Ik heb gehoord dat er in blok 3 een cursus start waarvan jullie de coördinatoren zijn, en dat de opzet van deze cursus mogelijk zou kunnen aansluiten bij wat ik wil gaan onderzoeken. Mijn vraag aan jullie is dus: zou ik bij deze cursus aan mogen haken om data te verzamelen?

Ik zal in het kort toelichten waar mijn scriptie op gebaseerd is en wat er nodig is voor het onderzoek:

Van adaptieve instructie (waarbij een systeem/docent de juiste taken voor de behoefte van de lerende uitkiest) is aangetoond dat het kan leiden tot betere leerresultaten, maar omdat dit een stukje verantwoordelijkheid over reflectie op leren en het selecteren van geschikte taken bij de lerende wegneemt is het te verwachten dat het de zelfsturingsvaardigheden van lerenden niet ten goede komt. Ik wil onderzoeken of adaptieve feedback een rol kan spelen in het verkleinen van deze negatieve effecten.

Ik wil hiervoor een groep studenten verdelen over een conditie met hogere feedbackspecificiteit en een conditie met lagere specificiteit. De specificiteit van feedback gaat hierbij over de hoeveelheid informatie die de feedback bevat.

Wat ik concreet wil doen is het volgende:

- Vóór de cursus begint wil ik graag in overleg met de cursuscoördinator (en indien mogelijk het docententeam) om logistieke zaken te bespreken en om een protocol te ontwikkelen voor de feedbackcondities
- De eerste werkgroep wil ik een vragenlijst over zelfsturingsvaardigheden en motivatie afnemen (zal ongeveer een kwartier duren). Ook zal ik dan een informed-consent formulier laten ondertekenen door de studenten.
- Ik zou graag inzicht willen in de feedback die er uitgewisseld wordt
- Gedurende het proces zal ik na de feedbackmomenten kort inchecken bij de docenten die feedback geven om te vragen of het allemaal goed is gegaan en of er nog zaken zijn gebeurd die invloed kunnen hebben op de resultaten.
- Na afloop van de cursus zal ik nogmaals de vragenlijst over zelfsturingsvaardigheden en motivatie afnemen. Ook wil ik graag interviews houden met een aantal docenten die feedback gegeven hebben en met studenten die hebben deelgenomen aan de cursus.

Ik hoor graag of jullie hier interesse in zouden hebben.

Met vriendelijke groet,

Maartje Körner