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Why wonder "why"?

The effectiveness of elaborative interrogation as a learning technique within an e-learning course for commercial airline pilots.

Master Thesis Applied Cognitive Psychology

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Abstract

E-learning programs are a popular tool to convey knowledge or to serve as preparation in a flipped classroom set-up, in schools as well as for in-company training. The responsibility these programs give to the learner increase the risk of course failure. To support the learner, simple learning techniques can be incorporated. Dunlosky et al. (2013) identified elaborative interrogation (EI) as a promising learning technique. The current study analysed the effectivity of elaborative interrogation for supporting the learning of commercial airline pilots in an e-learning preparation for a communication course. The objective was to broaden the generalizability of EI as a learning technique, analyse its effectivity outside the academic context and possibly enhancing the effectivity of the target course. This study compared EI to an active control group using a different, noted less effective learning technique: summarization (Dunlosky et al., 2013). Prior knowledge is known to be an important moderator for the effectivity of elaborative interrogation, which was also incorporated in the experiment. Two groups of participants due to take this course at the time of research completed the e-learning, either answering 'why-questions' (EI prompts) or 'what-questions' (summarization prompts) per block of theory. No significant differences were found on performance between both learning techniques. The moderation analysis of prior knowledge could not be executed due to violation of important assumptions. Limitations and recommendations for future research are provided.

Keywords: elaborative interrogation, prior knowledge, e-learning, flipped classroom, commercial aviation

1. Introduction

E-learning entails all forms of training and education offered 'e-lectronically' (Sangrà, Vlachopoulos, & Cabrera, 2012) and has been around for the better part of two decades. E-learning can be used as a full course but is more often used as an addition to a classroom course. This combination of digital and non-digital course materials is referred to as *blended learning*. Blended learning knows a wide variety of executions and forms. One of the more popular forms is the *flipped classroom*. Here, the teacher or trainer offers theoretical background online for self-paced study and revision, so classroom hours can be used for practice and application of the learning (Abeysekara & Dawson, 2015). The flipped classroom has been found to significantly benefit cognitive learning outcomes (Cheng, Ritzhaupt, & Antonenko, 2018).

It is not strange that e-learning is often a part for the flipped classroom, for it effectively facilitates what makes the flipped classroom approach most appealing to learners. By making the learning materials easily accessible through an online environment, the learner is provided with the freedom to shape their own learning process (Abeysekara & Dawson, 2015; Bouhnik & Marcus, 2006; Schoech, 2000). Paradoxically, this flexibility is also what makes e-learning less attractive to many learners as opposed to face-to-face learning. Bouhnik and Marcus (2006) found that learners missed structure, that studying required more self-discipline and was experienced as less efficient than in a classroom setting. As a result, students may not feel as inclined or motivated to do the work (Wilson, 2013). This is risky in a flipped classroom approach. Not doing the work in the e-learning before class, or only partially, means not being optimally prepared. Consequentially learners will not be able to participate effectively. This could lead to reduced learning value of that class and to a lesser extent, the course as a whole (Yilmaz, 2017). In a sense, course effectivity becomes partially dependent on students' discipline. For a course in a scholastic setting, this may be only detrimental to the students' grade. However, the flipped classroom approach is also increasingly popular in many in-company training programs. For instance, for nursing staff (Hew & Lo, 2018), pharmacists (Gillette et al., 2018) and commercial aviation, which is the context of the current study. For these fields, course failure may lead to lower job performance, which is detrimental to more than just the learner.

Online environments offer many possibilities to support the learner in their learning process. One way is by providing prompts or exercises that stimulate the use of effective learning strategies. Dunlosky and colleagues (2013) reviewed ten well-known, easy-to-implement learning strategies on effectiveness. In the current study, we will focus on the

application of one of the techniques that was found promising, namely elaborative interrogation (EI).

1.1 Elaborative interrogation

EI is a learning technique that aims to spark the learners' innate curiosity by asking "Why is it so?". Then, the learner is required to form his or her own explanation to clarify what they just studied, based on what they learned about the subject shortly before and maybe what they already knew beforehand (Dunlosky et al., 2013). Attempting to support the significance of this material enhances the learning thereof (Pressley et al., 1992). The prompt "why" is necessary, for learners do not automatically try to explain the material to themselves or use their available prior knowledge (Bransford et al., 1982; Pressley et al., 1992). These generated answers are called *elaborations*. Elaborations are "any type of enhancements that clarify the original to-be-remembered information with respect to other information" (Hannon, 2012, p.299).

Learners from various age groups seem to benefit from applying EI when studying. It has been found effective for individual learners from middle schoolers (Seifert, 1992; Woloshyn et al., 1994a) to university students from different levels (Dornisch & Sperling, 2006; Dornisch, Sperling, & Zeruth, 2011; Johnson et al., 2014; Willoughby et al., 1993; Willoughby et al., 1994; Woloshyn et al., 1990; Woloshyn et al, 1992). EI can also be helpful when working in dyads (Woloshyn et al., 1994b) or working online (Dornisch & Sperling, 2006). Moreover, the effectiveness of EI does not seem to be dependent on the topic at hand (Dunlosky et al., 2013).

1.2. Distinctive processing

EI is thought to support learning by integrating and contrasting what is new with what is known (Dornisch et al., 2011; Martin & Pressley, 1991; Ozgungor & Guthrie, 2004; Smith, Holliday, & Austin, 2010; Willoughby et al., 1993; Woloshyn et al., 1990). This process is called distinctive processing (Rawson & Van Overschelde, 2008). Distinctive processing is the combination of organizational and item-specific processing (Hunt, 2006; Rawson & Van Overschelde, 2008). Organizational processing is assigning new knowledge to existing categories of knowledge in memory through noticing the similarities between new and prior knowledge. Item-specific processing, on the other hand, is making new knowledge identifiable on its own, noticing what makes a new knowledge item unique and identifiable compared to other items or prior knowledge. In combining the new with the known the learner enhances his or her understanding of the material at hand (McNamara, 2009). Additionally, it may enhance

the relevance and meaningfulness of the learning material for it is made to fit within the context of familiar, existing knowledge (Dornisch et al., 2011; Pressley et al., 1992). This makes the new knowledge an expansion on prior knowledge, rather than a loose addition to it.

The role of prior knowledge

Prior knowledge plays a key role in distinctive processing. In a study assessing the effect of expert knowledge on memory performance using distinctive processing, Van Overschelde, Rawson, Dunlosky and Hunt (2005) had participants memorize two lists. One list contained domain-relevant knowledge items, in this case American Football-players, the other list contained domain-irrelevant knowledge items: letters and numbers. Half of the participants were American Football fans, they were considered to be the experts in this case, the other half were not American Football fans. Van Overschelde and colleagues (2005) found that the "experts" strongly outperformed the non-experts on the recognition task for the American Football-players. This means that distinctive processing benefits from prior knowledge. Since the expert's knowledge may be more detailed, it could be that it becomes easier to find unique identifiers for each item, thereby facilitating item-specific processing (Hunt & Rawson, 2011). Consequentially, EI may work better for students with more prior knowledge, ergo a higher level of expertise, on the subject than those who have less expertise. This is consistently found across many previous empirical studies (Pressley, 1992; Seifert, 1992; Willoughby et al., 1994; Woloshyn et al., 1992; Woloshyn et al., 1994a; Woloshyn et al., 1994b).

1.3. Generalizability

Despite the promising accounts for the effectiveness of EI as a learning technique, it was judged by Dunlosky et al. (2013) as only moderately effective because generalizability is disputable. The main reason to doubt generalizability is that little of the empirical research has been done in a naturalistic setting (Dunlosky et al., 2013). One of the few field studies was done by Smith, Holliday and Austin (2010). They recruited participants enrolled for an undergraduate biology course and used the material they were already required to study. Furthermore, students read the passages in a classroom setting, at their own pace. Results showed significant benefits for EI as a learning technique as opposed to a rereading control group on a test of comprehension. However promising these results may be for real-world application, this study alone is not enough to support ecological validity of EI. Most other experiments took place in a university laboratory, with learning materials that were solely used for the purpose of the experiment and with set time limits. These are considerably different circumstances than in the study of Smith et al. (2010), which come fairly close to natural. These

are not the only deviations from the natural setting. For example, previous studies of EI almost exclusively train and test the knowledge of facts. This is problematic, since factual knowledge usually only makes up a small part of what is required to pass a course, especially at higher levels of education. Additionally, many of these experiments use recognition, recall, or both as indicators of performance (Dornisch et al., 2011), whereas most tests in higher education are aimed at comprehension. Another reason to doubt generalizability, though not mentioned by Dunlosky and colleagues (2013), is that previous research close to exclusively uses different levels of scholastic education, from middle school to university, as the learning context. This is unfortunate, for there are many in-company training programs that could also benefit from the application of effective learning techniques. Especially considering the aforementioned rise of the flipped classroom approach in in-company training (Gillette et al., 2018; Hew & Lo, 2018).

Finally, there are also studies that found null results. This includes two experiments performed in a naturalistic setting (reading comprehension for Spanish as a second language learners) (Callender, Medina, & Brantmeier, 2013; Medina, Callender, Brantmeier, & Schultz, 2017), that compared EI to active and inactive control groups, and a study by O'Reilly (1998) that concluded that "EI was no more effective than repetition".

1.4. The current study

The objective of this study is to examine the effectiveness of EI as a learning technique and analyse the role of prior knowledge as a moderator in a naturalistic e-learning context. The implications of the current study are threefold. First, studying a promising, cost-effective and easy to implement learning technique like EI can help education support learners, through making sure these techniques are evidence-based. Secondly, the scientific field surrounding effective learning techniques and EI is expanded by this attempt to stretch the boundaries of its generalizability. The current study takes EI away from fictitious learning materials, out of the scholastic context and away from time limits. Lastly, the application of EI in e-learning courses as part of a flipped classroom set-up within the scholastic or professional context could minimize the risk of course failure by facilitating deep processing of the learning materials. Consequentially, it could counter the costs of course failure, which can be disastrous in some professional fields. The research question we aim to answer here is "*What is the effectiveness of elaborative interrogation as a learning technique applied in an e-learning course for commercial airline pilots?*"

As mentioned before, we aim to apply EI in a non-scholastic, naturalistic, online, self-paced context. Therefore, the current study is set in a professional learning context: a mandatory

crew resource management (CRM) course on communication for commercial airline pilots at KLM Dutch Royal Airlines. This communication course knows a flipped classroom instructional set-up, with e-learning preparation and a classroom training day. EI was implemented in the e-learning preparation for half of the classes and compared to a less effective learning technique that was implemented in the other half of the classes: summarization. The choice for summarization as an active control is further explained in the method section of this thesis. To address the issue raised by Dunlosky et al. (2013) on the low variety in type of to-be-learnt materials, the current course mainly involves models, theory and techniques, rather than factual knowledge. Since prior knowledge is known to be a moderating factor (Hunt & Rawson, 2011), this will also be taken into account and a moderation analysis will be performed.

1.5 Hypotheses

H1. It is hypothesized that prompting elaborative interrogation during online training results in higher level of knowledge retention than prompting summarization for pilots in communication training.

This hypothesis is suggested by the distinctiveness theory by Rawson and Van Overschelde (2008) that knowledge improves memory through distinctive processing. Additionally, this is hypothesis is based on research by Dunlosky and colleagues (2013) stating that EI is effective for many different groups of learners across many different topics.

H2. It is hypothesized that the level of knowledge retention after training is moderated by the level of prior knowledge for elaborative interrogation.

This hypothesis is based on findings by Hunt and Rawson (2011) that showed that accuracy on a recognition test, after distinctive processing, was a direct function of the expertise participants had on the topic before the experiment. Participants are expected to have some prior knowledge, as most CRM topics are also part of other mandatory training programs. Communication as a competency is inherent to the successful execution of all the other competencies when working in a flight crew team (Mansikka, Harris, & Virtanen, 2017). Therefore, regardless of which CRM topics they have already encountered during simulator training, they will have practiced communication skills before. However, the emphasis on the underlying theory is low for these other training programs. For this reason, we do not expect ceiling effects on the prior knowledge test.

2. Methods

The current study is a field quasi-experiment, using a convenience sample and a mixed between-within subjects design. It involves a comparison on learning effect within subjects over time, between two groups using a different learning technique with an analysis of moderation by prior knowledge. We speak of a quasi-experiment, for true randomization is not possible. The reason for this is that the intervention cannot be applied by the software per person, but only per course.

2.1 Design

Two versions of the e-learning preparation for the CRM course 'Communication' were created to manipulate the first categorical independent variable: *learning technique*. Classes were randomly assigned by the training department to either the experimental or the control condition. The experimental group completed e-learning enriched with EI prompts. These prompts are provided via a plug-in called "The Travel Journal", which is explained more extensively in *2.5 Materials*. The original course did not involve a version of the travel journal. Adding the travel journal in the experimental condition only, would lead to a large difference in the time needed to complete the e-learning. That would make it impossible to conclude something about the effectivity of EI as a learning technique, because then a difference in performance in favour of EI could also be explained by more time-on-task or simply more exercise regardless of the nature of the prompts. To make sure the experimental and control group were counterbalanced, the control condition also involved prompts. These encouraged the use of a different learning technique: summarization. This technique is appropriate as an active control condition, for Dunlosky and colleagues (2013) judged summarization as low in effectiveness. Another reason to choose summarization is that it is many learners' default learning technique for studying new material. The independent variable learning technique therefore encompasses two categories (EI and summarization) and is manipulated between subjects. The second independent variable is *time*. This is a two-level categorical variable (pre-test and post-test) and manipulated within subjects. The two time points are the administrations of a knowledge test (**Appendix A**), which was taken at the start and at the end of the e-learning course. As a consequence of our wish to make the experiment self-paced, the width of the time frame is determined by the participant and can vary from eight weeks to a few hours. Again, more time-on-task could also explain higher knowledge retention. Alternatively, the spacing of practice with the learning materials could also lead to an improvement in performance (Dunlosky et al., 2013). To control for these alternative explanations, the intensity of

interaction with the learning environment was measured in two interval variables. *Active period* is the number of days between the first and the last login to the course. Whereas *Active days* is the number of individual days on which the participant logged on within the active period. As mentioned before, *prior knowledge* was taken into account as a main moderating variable in the current study. Prior knowledge is measured at ratio level in the knowledge test at the beginning of the course, for which participants will receive a grade from 0 through 10. Lastly, data on *gender*, *age* and *aircraft division* was collected to rule these out as indicators of performance.

The current study has two dependent variables. First, *knowledge retention* is the main dependent variable. It is measured at the completion of the e-learning using the same knowledge test as for prior knowledge. Secondly, *course evaluation* is the rating of the entire course module, including the training day. It is measured at interval level on a scale from 1 through 10. We have no specific expectations for the influence of difference in learning technique on the course evaluation. Therefore, it will be part of the exploratory analyses. An overview of the design is visualized in *Figure 1*.

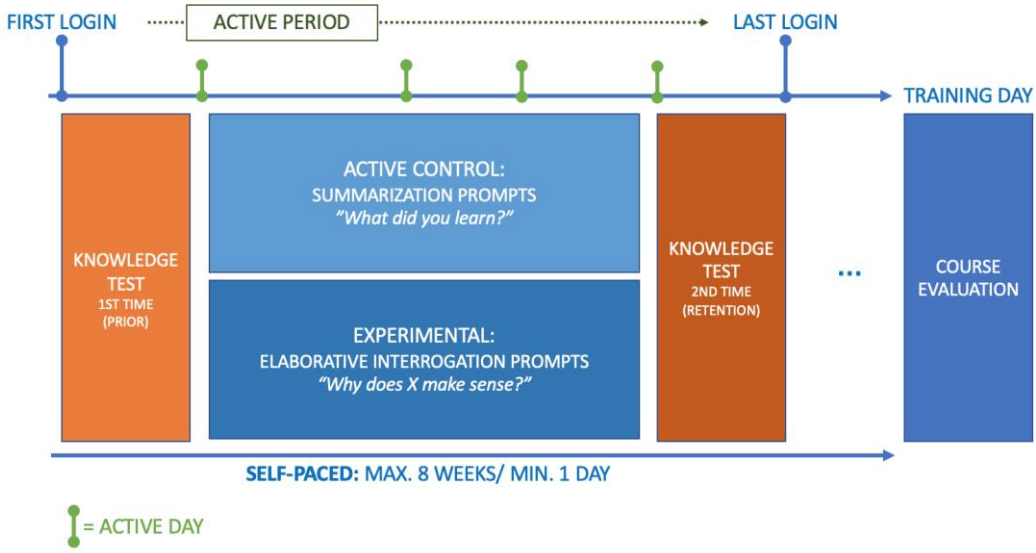

Figure 1. A visualization of the research design.

2.2 Participants

All participants were airline pilots at KLM hired after 01-01-2019. These pilots were all scheduled to follow the 'Communication' module between July 10th and August 26th, 2020. There were no other exclusion criteria. In total 58 participants took part in the study (Male/Female/Unknown = 45/2/11; Age (M)= 30.60y, SD= 5.88). 30 participants performed the control condition and 27 performed the experimental condition. One person did not fill out

the identification number needed to retrieve in which condition they took part. An overview of the sample characteristics can be found in *Table 1*. Most pilots that were due to follow this course during the research period belonged to the B737 division. This created an unequal spread of the aircraft divisions over the groups. The impact of this inequality will be assessed in the analysis. All pilots, regardless of whether they chose to participate in the study completed either two of the versions constructed for the current study, instead of the original e-learning. However, they were free to decide whether they wanted to make their data available for this study and gave permission via informed consent (**Appendix B**). If participants completed both knowledge tests and the course evaluation, they had a chance to win one of four bol.com gift cards of 25 euros. These were allotted after data collection was finished.

Ethical aspects of the current study were reviewed by the Psychology Research Ethics Committee of Leiden University. The study is in line with the General Data Protection Regulation and adheres to all other guidelines and regulations as described by the Psychology Research Ethics Committee.

Table 1

Sample characteristics total and per condition.

	Total	Summarization	Elaborative interrogation
	N= 58	N= 27	N= 30
Gender	*Missing= 11*	*Missing= 7*	*Missing= 4*
Male	44	20	24
Female	2	0	2
Age (years)	M= 30.60 (SD= 5.88)	M= 30.00 (SD= 7.08)	M= 31.10 (SD= 3.88)
Aircraft division	*Missing= 11*	*Missing= 1*	*Missing= 10*
A330	6	2	4
B737	27	13	14
B777/787	7	7	0
Embraer	6	4	2

2.3 Procedure

Every month 6 classes of 6 to 8 participants are invited to this communication training 4 to 8 weeks prior to the training day. This grants them enough time to complete the e-learning.

During the study, the number of participants per group and weeks prior to the training day varied due to changing regulations involving the CoVid-19 pandemic. The invite gave them the information needed to log on to the e-learning. Simultaneously, course instructors received a letter (**Appendix C**) explaining the changes made for the purpose of the experiment, what was expected of them and who to contact if they had questions. The same two instructors train 2 classes on consecutive days. Either both classes were assigned to the control condition or to the experimental condition to minimize confusion.

The e-learning course could be completed at the participants own pace, on their own device of choice. The e-learning plus the additions made for the study took approximately 2 hours to complete. Participants started with the pre-test, which was accessed via an embedded link to Microsoft Forms. The pre-test opened with an informed consent which informed them about the purpose of the study, compensation for their participation and asked them permission to use their answers. Additionally, they were informed that participation was voluntary and anonymous and that they could choose to retract their data from the experiment at any time, without giving a reason by contacting the researcher. Then, participants studied the course material and encountered a link to the Travel Journal for each block of theory, 13 in total. In both conditions the Travel Journal was introduced as a tool to support their learning and it was explained that their answers would only be visible for themselves and the course instructors. Afterwards they filled out the post-test and were asked for consent to use their activity logs and evaluation ratings for research. The link to the course evaluation was provided by the instructors at the end of the training day. Finally, participants received a debriefing letter which further explained the purpose of the study. Furthermore, they were given the contact information for complaints or if they wished to retract their data.

2.4 Materials

Measurements

Knowledge test 'Communication' – prior and retention

This test was administered as pre- and post-test. This test was devised by the researcher for the purpose of this study. It contains 14 multiple choice questions, 13 with 4 choices and 1 with 2 choices and an 'put in the right order'-question. The test was evaluated by three senior Human Factor instructors at KLM, who were responsible for the creation of this course. After revision based on their comments, the test was sent out to a small population (N=10) of Second Officers (SOs) who already completed the communication module. This was done to gain insight in what type of distribution can be expected for the experimental population. Also, the SOs rated

the test on completeness, clarity and level on a scale from 1 to 10. On average, they scored 10/15 questions correct. Completeness and clarity both scored 8/10 (1 = not at all complete/clear, 10 = entirely complete/clear) on average, suggesting that the test is fairly complete, and the questions are formulated fairly clear. Test level was rated at a 5.8/10 (1= Too easy, 10 = Too hard) which means the test was experienced as approximately the right level for the course.

Reliability of the knowledge test. As a check for the validity of the knowledge test Cronbach's alpha coefficient was calculated. The Cronbach alpha coefficient was $\alpha = .505$, which gives indication of poor internal consistency considering alpha should be minimally .7. Further revision of inter-item correlations supported this. Deletion of Q13 could slightly improve internal consistency, but not sufficiently so to be able to judge it as sufficiently internally consistent. Therefore, the scale was left intact. Poor reliability in this case means that the test may not provide a reliable reflection of the participants' knowledge on effective communication. Unfortunately, no alternative measure was available. The results should be interpreted cautiously.

Course evaluation

The course evaluation is a standard training evaluation form used for all Flight Crew training programs. It consists of a general part and a training specific part. The general part consists of a Net Promotor Score (NPS), ratings on a 5-point Likert scale on clarity, accomplishment of the training goals and usefulness of training and two open-ended questions on what they would keep the same and what they would change. For the communication course the training specific part addressed whether candidates feel the e-learning had successfully prepared them for the training day.

Activity logs

The activity logs were derived from Moodle to be transformed into the target variables *active period* and *active days*.

Intervention

Travel Journal

The Travel Journal is an LMS Moodle plug-in used in several other Flight Operations e-learning modules at KLM. It provides the means to add questions or room for notes per course section. The answers filled out by the participants are then combined in a journal-like overview. For the current study the Travel Journal was used to prompt the learning techniques. In the *control condition* the travel journal entailed a summarization prompt per topic, following the format: "What did you learn about topic/model X?". In the explanatory text participants were told that

this tool helped them by making them wonder about what they learned and summarizing that concisely. In the *experimental condition* the questions were EI prompts, following the format: "Why does X make sense?" or if it involved a technique "Why is X important for effective communication?". The explanatory text told participants that the travel journal would help them by making them wonder why what they read is true or why it works the way it does and then asking them to formulate the answer themselves.

2.5 Analyses

After completion of the data collection, the data was extracted from MS Forms and LMS Moodle and transported to MS Excel 2016. The required data was selected and matched per participant in Excel. After which the ID number was coded using a formula only known to the researcher. Also, the data from the activity logs was reduced to their target variables. *Active period* was the difference in days between the first and the last login. *Active days* was the computed by a count of individual dates on which activity was shown. Then the data was transported to SPSS 24 Statistical Package, where a grade was calculated from the scores on both administrations of the knowledge test for each participant. Participants received 1 point per correct answer. Then they were summed up to number of answers correct. Their grade was computed from the number of answers correct, divided by the number of questions and multiplied by 10. This results in a grade between 1 and 10 for *prior knowledge* and *knowledge retention*. Data was checked on outliers and missing data, for which possible causes were examined and reason for deletion from the set was evaluated.

Hypothesis 1: The effect of learning technique

H1. It is hypothesized that prompting elaborative interrogation during online training results in higher level of knowledge retention than prompting summarization for pilots in communication training.

To test this hypothesis, a mixed between-within subjects analysis of variance (ANOVA) was performed. Performances were compared within-subjects over *time* (prior vs. retention knowledge) and between-subjects on *learning technique* (EI vs. summarization). Furthermore, the interaction effect (*time* X *learning technique*) was evaluated. The hypothesis is accepted if EI leads to a significantly higher performance than summarization. This means the between-subjects effect *learning technique* should be significant ($p<.05$), indicated by the F-statistic and higher mean score for EI. However, if the interaction effect is significant ($p<.05$), main effects will become less straight forward to interpret. We may expect the interaction to be significant,

since prior knowledge has a moderating role in the effectivity of EI (Overschelde et al., 2005) and this is not necessarily true as well for summarization.

Hypothesis 2: Moderation by prior knowledge

H2. It is hypothesized that the level of knowledge retention after training is moderated by the level of prior knowledge for elaborative interrogation.

To test this hypothesis, we planned to perform an ANCOVA with *knowledge retention* as a function of *learning technique* and with *prior knowledge* as a mediator and assess the interaction of *learning technique* with *prior knowledge*. Specifically, to see if the elaborative interrogation group profited more from prior knowledge than the summarization group. For this hypothesis to be accepted, the F-statistic should be significant ($p < .05$).

Control and exploratory analyses

To control for the impact of unequal spread of the aircraft division across groups we will create a scatterplot for each group and fit regression lines per aircraft division. In this way we can explore if different groups of pilots may respond differently to training.

For the analyses using the activity logs, a difference score *knowledge improvement* was calculated by subtracting *prior knowledge* from *knowledge retention*. Pearson's R correlations do not easily reach significance with a small sample size like in the current study, even if the strength of the correlation is substantial (Pallant, 2015). Therefore, we focus on the strength of the relationship as indicated by the correlation coefficient *r* and the amount of variance explained (R^2).

We checked if activity based on *active days* was related to *knowledge improvement*. This was done to control for the possibility that more time-on-task may be related to higher learning outcomes. A Pearson's' R correlation was conducted. The impact of time-on-task on the learning outcomes is disregarded as an alternative explanation if the strength of the relationship is small: r= .10 to r= .29, and the percentage of shared variance too (Cohen, 1988).

To explore the effect of spacing on test performance, we also checked the correlation between *active period* and *knowledge improvement*. This would show if the spread of activity over a longer period is positively related to better performance on the knowledge test. The relation between spacing and knowledge improvement is considered meaningful if the correlation coefficient is at least medium: r= .30 to r= .49 (Cohen, 1988).

Lastly, we explored if the different learning techniques led to different course evaluation using an independent samples t-test.

3. Results

3.1 Data screening

Missing data

The data set suffered from a large amount of missing data. Out of 58 participants, 31 completed both the pre- and post-test, 16 only the pre-test and 10 only the post-test. One participant did not fill out the ID registration, therefore it was not possible to trace which learning technique this participant used or which post-test belonged to it. This case was disregarded. The missing pre-test scores were almost fully explained by a faulty link in the e-learning, causing the first few pre-tests to be completed without ID registration or informed consent. These could not be used for participants did not give permission, nor were they identifiable. The two classes that encountered this faulty link were originally assigned to the EI group, which explains the higher drop-out rate for this group. Missing scores on the post-test could be a result of not feeling the need or the use of making the same test again. It is unlikely that the learning technique was responsible for this drop-out since it was almost equal (Sum/EI = 7/9). There was an uneven spread of drop-out over aircraft divisions, with more drop-out in the B737 (N = 9) and Embraer (N = 4) divisions. A possible explanation for this is that these divisions had a busier flight schedule during the research period, which may have resulted in a higher tendency to cut corners in finishing the e-learning. Also, the B737 formed a larger part of the sample from the start. Some participants chose to give permission for the pre-test, but not for the post-test. For the planned within-between subjects ANOVA, complete cases were required to be able to make the within-subjects comparison. Consequently, only the 31 complete cases were used. This means the power requirements (N = 32; Faul, Erdfelder, Lang, & Buchner (2007)) were not met by one case short. Methods for resolving missing data by interpolation or mean amputation all have their effect on the reliability of the analysis (Pallant, 2015). Considering the already questionable reliability on the main measurements we decided not to apply these methods. The altered sample characteristics can be found in *Table 2*. 35 out of 58 participants did not fill out the course evaluation form. As this was not essential to the main hypotheses, the mixed between-within subjects ANOVA was performed as planned. The exploratory analysis on the influence of the intervention on course evaluations was performed using the data available.

Table 2

Sample characteristics per condition after pairwise deletion based on availability of scores for *prior knowledge* and *knowledge retention.*

	Total	Summarization	Elaborative interrogation
Total	N = 31	N = 19	N = 12
Gender			
Male	30	18	12
Female	1	1	0
Age	M = 31.19 SD = 6.52	M= 31.53 SD = 7.59	M = 30.67 SD = 4.62
Aircraft division			
A330	5	2	3
B737	19	10	9
B777/787	5	5	0
Embraer	2	2	0

Outliers

No outliers on the main outcome variable were found as can be seen in the boxplot in Figure 2. No cases were deleted.

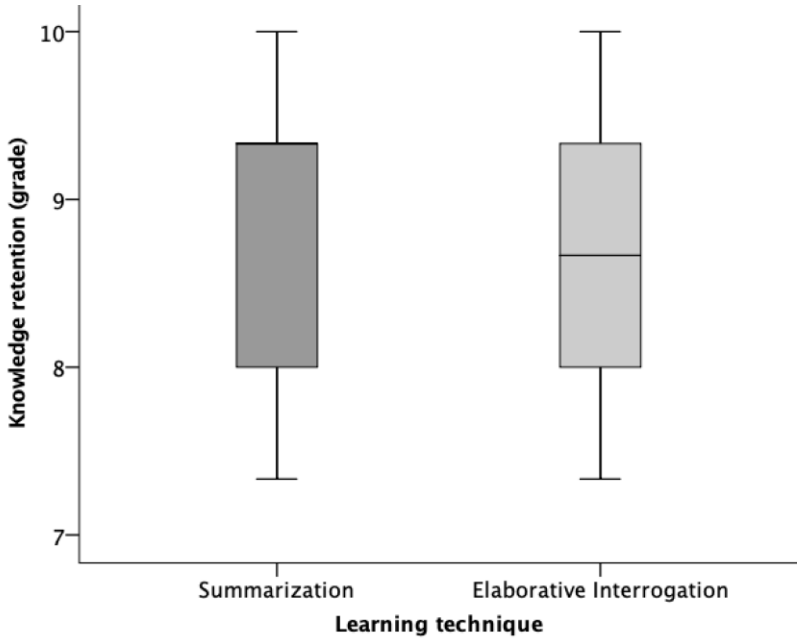

Figure 2. Boxplot of the mean performance on the knowledge retention test (Y) per condition (X).

3.2 Hypothesis 1: The effectiveness of elaborative interrogation

A repeated measures analysis of variance was performed. Cases were deleted listwise if either the prior or the retention knowledge test was missing, for the within-subjects comparison could not be made without it. This led to a sample of N= 31, with N= 12 for EI and N= 19 for summarization. Normality of the dependent variables was assessed using Q-Q plots and histograms. For prior knowledge the assumption is adhered to. For retention knowledge the distribution is skewed to the right (Kolmogrov-Smirnov: p <.001). This is considered an effect of learning: if the training works, grades after training should be more clustered in the higher regions of the scale. The analysis is considered robust for this violation with N>30. Homogeneity of variance was adhered to according to Levene's test (p > .05), as well as the homogeneity of intercorrelations according to the Box's M statistic (p > .05). This means we can interpret the results of the analysis as planned.

A mixed between-within subjects analysis of variance was conducted to assess the impact of two different learning techniques (EI, summarization) on pilots' grades on a knowledge test, before and after training. There was a large main effect for time, Wilks' Lambda = .246, F (1, 29) = 89.11, p < .001, partial eta squared = .754, with both groups showing an improvement in grades on the knowledge test after training (see Table 3 and Figure 3). The main effect comparing the learning techniques was not significant, F (1, 29) = 2.25, p = .144, partial eta squared = .072. This suggests there is no difference in grades on the knowledge test between the EI group and the summarization group. There was no significant interaction between learning technique and time, Wilks' Lambda = .97, F (1, 29) = .779, p = .39, partial eta squared = .03, indicating that the improvement in grade on the knowledge test over time is not different between the summarization control group and the EI group. This means both interventions are assumed equally effective. From these results we can conclude that both groups improved their knowledge about communication theories and models after completion of the e-learning, regardless of the learning technique they used. Thereby, we fail to reject the null hypothesis for H1.

Table 3

Knowledge test scores for Summarization and EI groups before and after training.

	Summarization			Elaborative interrogation		
	n	M	SD	n	M	SD
Prior knowledge	19	6.67	1.18	12	6.00	1.36
Knowledge retention	19	8.88	0.80	12	8.67	0.82

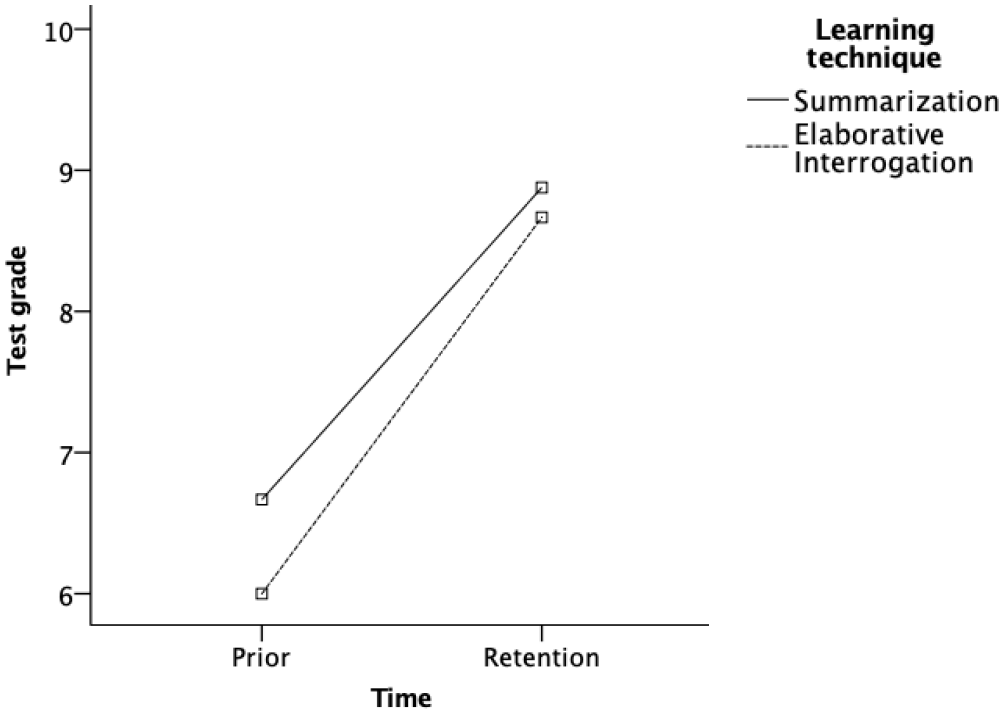

Figure 3. Estimated marginal means of performance on the knowledge test per learning technique on two time points.

3.3 Hypothesis 2: Prior knowledge as a moderator

After preliminary analysis and checking of the required assumptions for this procedure the analysis of covariance, with *knowledge retention* as a function of *learning technique* using *prior knowledge* as a moderator, was not performed. There were several reasons that lead to this decision. First, as mentioned before, the power requirements were not met after exclusion of an individual if either the prior or the retention knowledge test was missing. Secondly, the covariate was not measured reliably (Cronbach's alpha < .7). Thirdly, the assumption of linearity was violated as well. If the assumption of linearity is violated, performing ANCOVA has little added value over performing ANOVA (Pallant, 2015). Violation of the linearity assumption reduces the power of ANCOVA, while adding a covariate is intended to increase

power. The recommended procedure by Pallant (2015), is to drop the non-linear covariate from the analysis. Since *prior knowledge* is the only covariate, this would lead to the analysis not being performed. When looking at *Figure 4*, it is evident that the relationship between prior knowledge and retention knowledge is only weak judging by the spread of the dots, for the full sample, as well as per learning technique. Furthermore, the spread of the dots does not indicate a type of relation other than linear (e.g. quadratic or asymptotic).

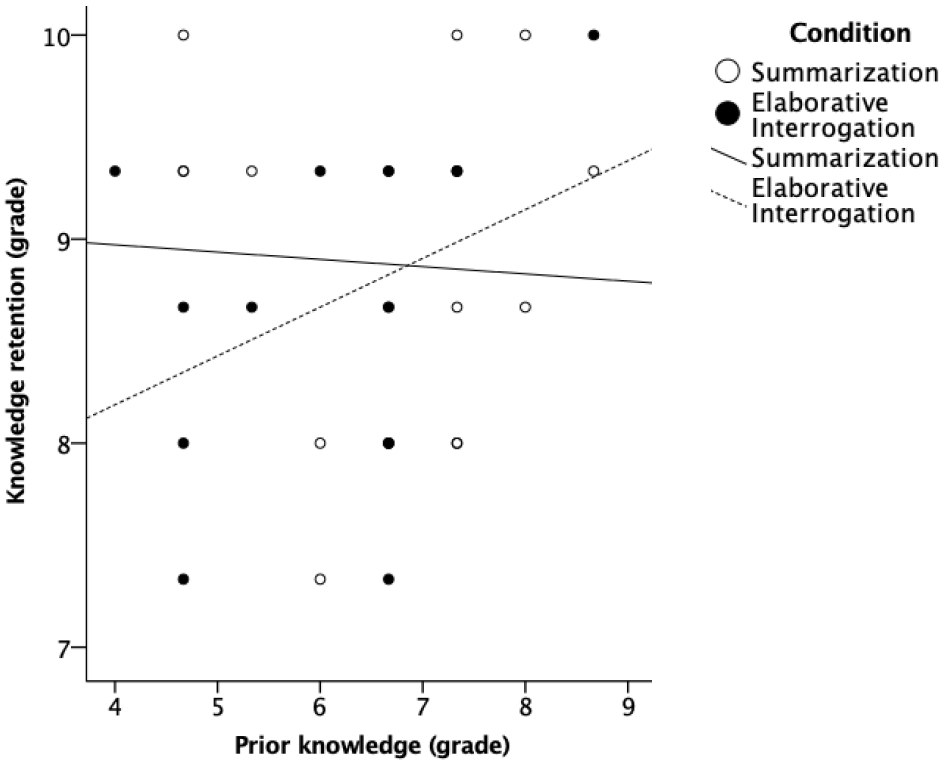

Figure 4. Scatterplot displaying the relation between performance on the prior knowledge test and the retention knowledge test.

Altogether, this gave us sufficient cause to not perform the analysis. Considering the lack and undermining of power, it is unlikely that the analysis, if performed, would be able to reach significance. Furthermore, even if the analysis did reach significance, the results are not based on reliable measurements and therefore difficult to draw conclusions from. ANCOVA does not have a suitable non-parametric alternative (Pallant, 2015).

3.4 Control analyses

Effect of aircraft division

For this analysis we created a simple scatterplot with *knowledge retention* as a function of *prior knowledge* with markers set by *aircraft division* and lines fitted at subgroups as can be

seen in *Figure 5*. Keep in mind that our sample size for some divisions is very limited (for example: Embraer $N = 2$) and the exploratory nature of this analysis, therefore no conclusion can be drawn from this. Nevertheless, there is some indication of differential effects per aircraft division, which could have affected the outcomes of the mixed within-between subjects ANOVA.

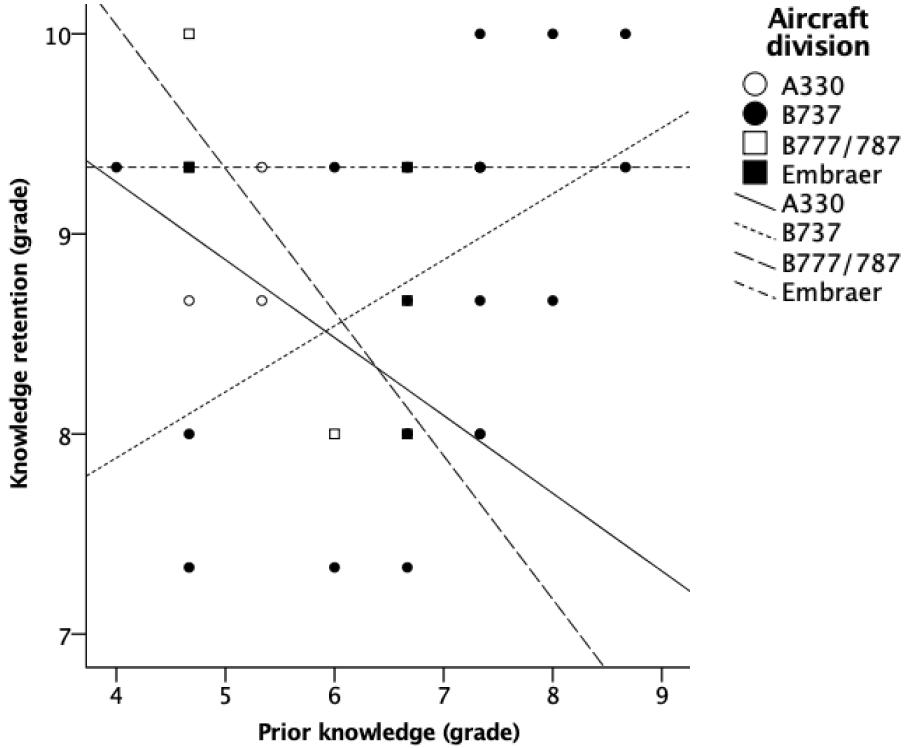

Figure 5. Estimated regression lines for the relationship between performance on the prior knowledge test and the knowledge retention test per aircraft division.

Time on task (active days X knowledge improvement)

For the analyses using the activity logs the difference score '*knowledge improvement'* was calculated by subtracting *prior knowledge* from *knowledge retention*. For this analysis the goal was to assess the relationship between the activity in the e-learning and the improvement in score on the knowledge test. The main reason for this is to exclude time-on-task as an alternative explanation for improvement on the knowledge test. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. A Pearson's correlation revealed that activity in the e-learning spread over more days was not significantly related to greater improvement on the knowledge test, $r = -.116$, $N = 31$, $p = .534$. The effect size was small, $R^2 = .013$. This means that the amount of time spent in the e-learning environment explains little to no variance in the performance on the knowledge retention test.

3.5 Exploratory analyses: The effect of spacing and course evaluation

Spacing (active period X knowledge improvement)

The relation between active period and knowledge improvement was checked following the same procedure as for time on task. A Pearson's correlation revealed that activity in the e-learning spread over more days was not significantly related to greater improvement on the knowledge test, $r = -.246$, $N = 31$, $p = .183$. The effect size was small, $R^2 = .06$. This suggests a weak relation between spaced activity and performance improvement on the knowledge test.

Course evaluation (learning technique X course evaluation)

An independent-samples t-test was performed to compare course evaluations for the different learning technique groups. The course evaluation was only performed by 23 out of 58 participants (Summarization: $N = 14$, EI: $N = 9$). This showed no significant difference in course evaluation (1-10) for summarization ($M = 8.43$, $SD = 1.02$) compared to EI ($M = 8.67$, $SD = 1.23$; $t(21) = -.506$, $p = .62$, two-tailed). The effect was small (eta squared = .01).

4. Discussion

The aim of the study was to broaden the generalizability of EI as a learning technique, add to the evidence for its effectivity and minimise course failure. We attempted to achieve this by investigating the effectivity of EI when applied in a non-scholastic, naturalistic, online, self-paced context. The research question we tried to answer was: "*What is the effectiveness of elaborative interrogation as a learning technique applied in an e-learning course for commercial airline pilots*?" Below we discuss the findings and limitations of the current study and provide suggestions for future research.

4.1 Findings

No significant effects were found, other than that participants improved on the knowledge test after completion of the e-learning. The superiority of EI over summarization in effectivity, as specified in our first hypothesis, was not supported by the results of the current study. No differences in performance were found as a result of learning technique between experimental group and active control. Participants did improve significantly on the knowledge test after completion of training, regardless of how much time they spend. Furthermore, we were unable to analyse and thereby support the role of prior knowledge as a moderating factor. All in all, a failure to replicate the results of previous studies on EI and prior knowledge and a null result.

There are two possible lines of explanation for these null results. One is that the intervention has no effect and the null hypothesis is true. It is possible both groups improved regardless of the use of a learning technique. This study did not compare to an inactive control and can therefore not exclude this latter option. The null results would be in line with research done on the use of EI as a learning technique for reading comprehension in second language learning (Callender, et al., 2013; Medina et al., 2017; O'Reilly, 1998). These studies made use of similar questions prompts (though they use the term 'adjuncts'). Both showed no significant differences and no significant, favourable effect of EI prompts on performance on free recall or multiple-choice tests and in some cases even harmed performance (Callender et al., 2013). An explanation for these results was that reading in a second language is already quite effortful for working memory and the addition of EI prompts overrides the maximum working memory capacity (WMC). As the EI prompts were more beneficial for those with a larger WMC. This explanation could clarify why effective, beneficial effects of EI have mainly been found in studies that used factual knowledge as their target learning material. Theories and models may require more from WMC than factual knowledge.

The alternative is that there ***is*** an effect, but it was not strong enough to be detected by the statistical analyses performed: a false negative. There are several possible explanations. First, in re-evaluation of the estimated marginal means resulting from the MBWS ANOVA (*Figure 3*), we do see a slightly steeper improvement for the EI group over time, indicating higher effectivity over summarization. Possibly, this effect (*time* X *learning technique*) was not significant due to insufficient power.

Secondly, a weak effect could be due to the comparison with an active control group. Previous research on EI commonly uses a repetition (rereading or stating aloud) control group (for example: Dornisch & Sperling, 2006; Smith et al., 2010; Woloshyn et al., 1990). These learning techniques are somewhat shallower than summarization in terms of effort. It could be that the relative difference in effectivity of EI compared to summarization is smaller than EI compared to those techniques, and therefore was non-significant. This would mean that the relative benefit of using EI as a learning technique over summarization, may be dismissible. However, Callender et al. (2013) and Medina et al. (2017), unlike the current study, did use an inactive control group and found no significant differences as compared to those who used EI or 'embedded' prompts. The same is true for the O'Reilly (1998) study, which compared to repetition and self-explanation control and found that self-explanation was beneficial for learning, but EI and repetition yielded lesser, non-significant results. If the results of the current

study are the consequence of a similar effects, controlling for relative effectivity would not make a difference.

Thirdly, it could be that no effect was found, because there was a difference in directionality of the effect per aircraft division. However, the sample size was too small for some of the aircraft division to be certain of this difference. For further research in commercial aviation training, division effects and possible differences in CRM training needs poses an interesting opportunity.

4.2 Limitations

Methodological limitations

First, random assignment was not possible. While fully random assignment is still held as the golden standard, according to Shadish, Clark, and Steiner (2008) this does not have to be a major issue. They found that experiments with non-random assignment yields similar results as random assignment experiments. However, requirements for this are (1) that participants in both control and experimental group are taken from a population with similar characteristics, (2) participants cannot choose their condition and that (3) similarity of the two groups on important covariates is substantiated. The current study only adheres to the first two. As demonstrated, the convenience sample used led to an unequal spread of aircraft division over groups, which may have impacted the results of the MBWS ANOVA through differential relation.

Secondly, the unsure reliability and validity of the knowledge test is another limitation. The knowledge test was devised by the researcher for the purpose of this study for no other measure of performance on training was readily available. Some quality checks, like review by an expert panel, were performed but this does not replace a full validity research. Furthermore, the knowledge test was identical for the pre-test and the post-test. This could have resulted in a test-retest effect, meaning that improved performance on the post-test can be a result of making the same test again. Future research should use a larger variation of questions, to make up multiple versions for a pre-test and post-test.

Thirdly, as mentioned, the current study did not use an inactive control group, which means we are unable to say if using *a* learning technique, be it summarization or E.I., is at least beneficial over no learning technique at all. This was done intentionally, for it would create unfairness in time participants were required to spend on finishing the e-learning, since the Travel Journal required some extra time from the participants.

Fourth, for privacy reasons and securing a 'safe' learning environment, it was not possible for the researcher to analyse the responses given to the summarization and EI prompts. Instructors reported that the Travel Journal was, in most cases, filled out with care.

Conceptual limitations

First, we realize that the current study makes use of a very specific professional population. This may make it hard to generalize the results to professional fields beyond commercial aviation. Furthermore, the current study failed to check for the impact of the use of different learning techniques on classroom performance, since the e-learning was part of a flipped classroom setting. Our measure of 'retention knowledge' accounted for a level of preparation but did not account for how well participants were able to put this knowledge into practice. This would indicate transfer. Even further transfer may also pose an interesting venue for research in commercial aviation training, by evaluating how communication skills are applied on the job after training. This was beyond the scope of the current research.

4.3 Significance

A word of caution: there are many side notes to the results found in the current study, so they should not be treated as evidence. As for theoretical significance, there are different, possible explanations for how these results came to be. Therefore, nothing sure can be said about how this affects existing theories on EI. Based on these results we cannot make specific recommendations for training, other than to proceed to research ways to support learners in their learning process.

4.4 Future research

In the field of commercial aviation training, promising ways for improving training may be identified by exploring differences in response to training and training needs between aircraft divisions. Additionally, investigating the transfer of training from classroom to cockpit, could help in the evaluation of training programs overall.

Future research on the effectiveness of EI and the generalizability thereof should focus on field experiments. Applied studies, like the current one, form a small minority in the available empirical literature. Especially now, during and likely after CoVid-19, the majority of any type of higher education is given online. Learners are therefore more dependent on their own strategies than ever. This may be the best time to conduct such research. EI and various other learning techniques are seen as promising to improve student learning in an easy, cost-effective manner (Dunlosky et al., 2013). An example would be to adapt the design of the current

research to other online courses for professionals in various fields. Many larger companies offer their employees the possibility to improve their soft skills or update their knowledge on management strategies, for example Agile or LEAN, via large open learning platforms. By targeting a large and varied population on multiple subjects, the limits of the generalizability of the effectiveness of EI can be identified. Moreover, researchers should consider implementing various learning techniques in the same experiment to assess relative effectivity. Finally, different ways of assessing pre- and post-testing performance should be devised to avoid test-retest effects. It is of the essence that the academic field invests in bringing designs for future empirical research closer to the classroom to promote these techniques from ‘promising’ to ‘proven’ or to be able to disregard some of them once and for all.

4.5 Conclusion

The current study yielded null results in its investigation of the relative effectivity of EI over summarization prompting, applied in an online theoretical preparation for a communication course for pilots in commercial aviation. The role of prior knowledge in this could not be evaluated properly due to non-adherence to some of the assumptions for planned analysis. Based on these results, no practical implications for supporting online self-paced learning in practice, be it flipped classroom or not, could be made. Regardless, several interesting directions for future research were made that can help improve our understanding of the effectivity of learning techniques when put in practice.

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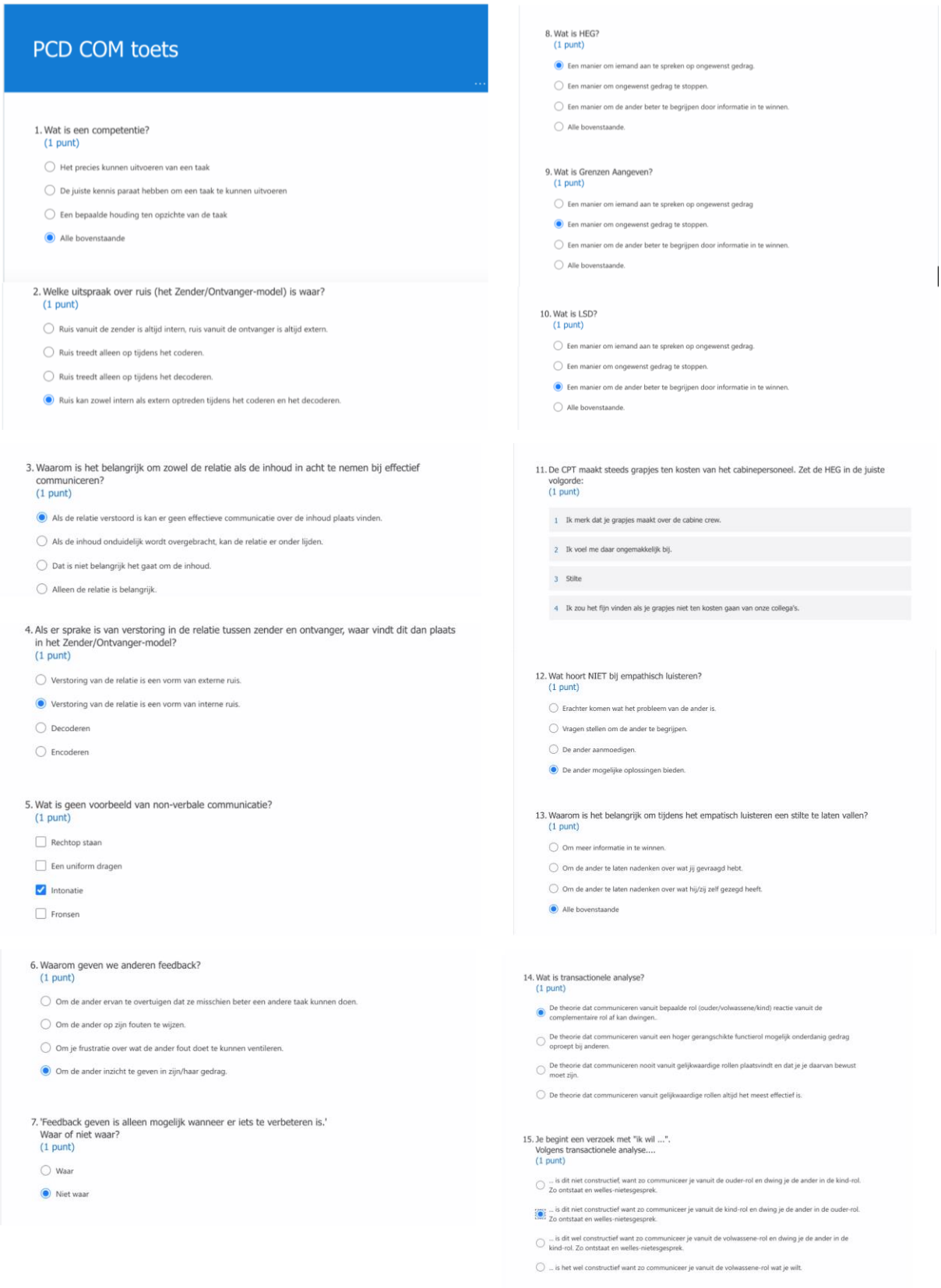
APPENDIX A: Knowledge test

The correct answers are indicated.



PCD COM toets

1. Wat is een competentie?
(1 punt)
- ○ Het precies kunnen uitvoeren van een taak
- ○ De juiste kennis paraat hebben om een taak te kunnen uitvoeren
- ○ Een bepaalde houding ten opzichte van de taak
- ● Alle bovenstaande

2. Welke uitspraak over ruis (het Zender/Ontvanger-model) is waar?
(1 punt)
- ○ Ruis vanuit de zender is altijd intern, ruis vanuit de ontvanger is altijd extern.
- ○ Ruis treedt alleen op tijdens het coderen.
- ○ Ruis treedt alleen op tijdens het decoderen.
- ● Ruis kan zowel intern als extern optreden tijdens het coderen en het decoderen.

3. Waarom is het belangrijk om zowel de relatie als de inhoud in acht te nemen bij effectief communiceren?
(1 punt)
- ● Als de relatie verstoord is kan er geen effectieve communicatie over de inhoud plaats vinden.
- ○ Als de inhoud onduidelijk wordt overgebracht, kan de relatie er onder lijden.
- ○ Dat is niet belangrijk het gaat om de inhoud.
- ○ Alleen de relatie is belangrijk.

4. Als er sprake is van verstoring in de relatie tussen zender en ontvanger, waar vindt dit dan plaats in het Zender/Ontvanger-model?
(1 punt)
- ○ Verstoring van de relatie is een vorm van externe ruis.
- ● Verstoring van de relatie is een vorm van interne ruis.
- ○ Decoderen
- ○ Encoderen

5. Wat is geen voorbeeld van non-verbale communicatie?
(1 punt)
- ☐ Rechtop staan
- ☐ Een uniform dragen
- ☑ Intonatie
- ☐ Fronsen

6. Waarom geven we anderen feedback?
(1 punt)
- ○ Om de ander ervan te overtuigen dat ze misschien beter een andere taak kunnen doen.
- ○ Om de ander op zijn fouten te wijzen.
- ○ Om je frustratie over wat de ander fout doet te kunnen ventileren.
- ● Om de ander inzicht te geven in zijn/haar gedrag.

7. 'Feedback geven is alleen mogelijk wanneer er iets te verbeteren is.'
Waar of niet waar?
(1 punt)
- ○ Waar
- ● Niet waar

8. Wat is HEG?
(1 punt)
- ● Een manier om iemand aan te spreken op ongewenst gedrag.
- ○ Een manier om ongewenst gedrag te stoppen.
- ○ Een manier om de ander beter te begrijpen door informatie in te winnen.
- ○ Alle bovenstaande.

9. Wat is Grenzen Aangeven?
(1 punt)
- ○ Een manier om iemand aan te spreken op ongewenst gedrag.
- ● Een manier om ongewenst gedrag te stoppen.
- ○ Een manier om de ander beter te begrijpen door informatie in te winnen.
- ○ Alle bovenstaande.

10. Wat is LSD?
(1 punt)
- ○ Een manier om iemand aan te spreken op ongewenst gedrag.
- ○ Een manier om ongewenst gedrag te stoppen.
- ● Een manier om de ander beter te begrijpen door informatie in te winnen.
- ○ Alle bovenstaande.

11. De CPT maakt steeds grapjes ten kosten van het cabinepersoneel. Zet de HEG in de juiste volgorde:
(1 punt)
1. Ik merk dat je grapjes maakt over de cabine crew.
2. Ik voel me daar ongemakkelijk bij.
3. Stilte
4. Ik zou het fijn vinden als je grapjes niet ten kosten gaan van onze collega's.

12. Wat hoort NIET bij empathisch luisteren?
(1 punt)
- ○ Erachter komen wat het probleem van de ander is.
- ○ Vragen stellen om de ander te begrijpen.
- ○ De ander aanmoedigen.
- ● De ander mogelijke oplossingen bieden.

13. Waarom is het belangrijk om tijdens het empatisch luisteren een stilte te laten vallen?
(1 punt)
- ○ Om meer informatie in te winnen.
- ○ Om de ander te laten nadenken over wat jij gevraagd hebt.
- ○ Om de ander te laten nadenken over wat hij/zij zelf gezegd heeft.
- ● Alle bovenstaande

14. Wat is transactionele analyse?
(1 punt)
- ● De theorie dat communiceren vanuit bepaalde rol (ouder/volwassene/kind) reactie vanuit de complementaire rol af kan dwingen..
- ○ De theorie dat communiceren vanuit een hoger gerangschikte functierol mogelijk onderdanig gedrag oproept bij anderen.
- ○ De theorie dat communiceren nooit vanuit gelijkwaardige rollen plaatsvindt en dat je je daarvan bewust moet zijn.
- ○ De theorie dat communiceren vanuit gelijkwaardige rollen altijd het meest effectief is.

15. Je begint een verzoek met "ik wil ...".
Volgens transactionele analyse....
(1 punt)
- ○ ... is dit niet constructief, want zo communiceer je vanuit de ouder-rol en dwing je de ander in de kind-rol. Zo ontstaat en welles-nietesgesprek.
- ● ... is dit niet constructief want zo communiceer je vanuit de kind-rol en dwing je de ander in de ouder-rol. Zo ontstaat en welles-nietesgesprek.
- ○ ... is dit wel constructief want zo communiceer je vanuit de volwassene-rol en dwing je de ander in de kind-rol. Zo ontstaat en welles-nietesgesprek.
- ○ ... is het wel constructief want zo communiceer je vanuit de volwassene-rol wat je wilt.

APPENDIX B: Informed consent

1. **Informed consent pre-test**

Beste deelnemer,

Deze toets maakt deel uit van een onderzoek in samenwerking met de Universiteit Leiden. Dit onderzoek naar leerstrategie voer ik uit in het kader van mijn afstudeerstage bij KLM.

Graag vraag ik toestemming voor het gebruik van de volgende gegevens:

- Antwoorden op deze meerkeuzetoets

Belangrijk om te weten is, dat de data omwille van jouw privacy volledig geanonimiseerd en gecodeerd wordt. Dit is niet naar jou terug te herleiden en kan niet zonder jouw toestemming gebruikt worden voor andere doeleinden dan het huidige onderzoek.

Bij deelname aan het *volledige* onderzoek maak je kans op het winnen van een bol.com cadeaubon ter waarde van €25,- (4x). De winnaar hiervan wordt 10 augustus bekend gemaakt. Je kunt er op elk moment voor kiezen om je deelname aan het onderzoek te beëindigen zonder opgaaf van redenen. Dit doe je door een mail te sturen naar robbie.janssen@klm.com. Als je je deelname beeindigt, maak je geen kans meer op het winnen van een van de cadeaubonnen. Ook als je kiest om niet deel te nemen aan het onderzoek kan je vrijblijvend gebruik maken van de toetsen *en het reisverslag* voor je eigen leerproces.

Naam:

Datum:

Ik heb bovenstaande informatie gelezen en begrepen: Ja/Nee

Ik geef wel/geen toestemming om mijn data te gebruiken voor het hierboven beschreven onderzoek.

Alvast bedankt voor uw medewerking namens KLM Crew Training en de Universiteit Leiden.

Met vriendelijke groet,

Robbie Janssen

0657538737

Robbie.janssen@klm.com

P.S. Voor klachten naar aanleiding van het onderzoek kunt u terecht bij dr. G.P.H. Band (band@fsw.leidenuniv.nl) namens de Universiteit Leiden.

2. Informed consent post-test

Beste deelnemer,

Deze toets en het feedbackformulier dat volgt maken deel uit van een onderzoek in samenwerking met de Universiteit Leiden om online training te optimaliseren. Dit onderzoek naar leerstrategie voer ik uit in het kader van mijn afstudeerstage bij KLM.

Graag vraag ik toestemming voor het gebruik van de volgende gegevens:

- Antwoorden op deze meerkeuzetoets
- Antwoorden op het feedbackformulier
- Login activiteit (aantal dagen dat je aan deze cursus hebt besteed)

Belangrijk om te weten is, dat de data omwille van jouw privacy volledig geanonimiseerd en gecodeerd wordt. Dit is niet naar jou terug te herleiden en kan niet zonder jouw toestemming gebruikt worden voor andere doeleinden dan het huidige onderzoek.

Wanneer je deel hebt genomen aan het eerste deel van het onderzoek, kun je door nu ook deel te nemen kans maken op het winnen van een bol.com cadeaubon ter waarde van €25,- (4x). De winnaar hiervan wordt 10 augustus bekend gemaakt.

Ook als je kiest om niet (langer) deel te nemen aan het onderzoek kan je vrijblijvend gebruik maken van de toets. Je kunt er op elk moment voor kiezen om je deelname aan het onderzoek te beëindigen zonder opgaaf van redenen. Dit doe je door een mail te sturen naar robbie.janssen@klm.com. Als je je deelname beëindigt, maak je geen kans meer op het winnen van een van de cadeaubonnen.

Naam:

Datum:

Ik heb bovenstaande informatie gelezen en begrepen: "Ja"

Ik geef wel/geen toestemming om mijn data te gebruiken voor het hierboven beschreven onderzoek.

Alvast bedankt voor uw medewerking namens KLM Crew Training en de Universiteit Leiden.

Met vriendelijke groet,

Robbie Janssen
0657538737
Robbie.janssen@klm.com

P.S. Voor klachten naar aanleiding van het onderzoek kunt u terecht bij dr. G.P.H. Band (band@fsw.leidenuniv.nl) namens de Universiteit Leiden.

APPENDIX C: Information letter for instructors

Beste HF-trainer,

De PCD COM trainingen van juli, augustus en september zijn geselecteerd om mee te doen aan wetenschappelijk onderzoek van de Universiteit Leiden. In deze brief vertel ik u graag meer over wat dit onderzoek inhoudt en wat er anders is voor u en de deelnemers ten opzichte van een niet-geselecteerde training.

Het onderzoek in het kort

In het licht van het huidige coronavirus wordt er steeds meer een beroep gedaan op effectieve elektronische leeromgevingen (ELO). De ELO ('Moodle') speelt ook een essentiële rol in de huidige PCD COM training: alle theorieoverdracht vindt hier plaats. Dit creëert ook een afhankelijkheid: de effectiviteit van de trainingsdag wordt afhankelijk van hoe serieus er aandacht wordt besteed aan de informatie in de ELO. Dit onderzoek evalueert manieren om interactie tussen de student en de theorie te verhogen. Of dit gelukt is bepalen we door het leereffect te meten.

Wat is er anders in Moodle?

1. Bij de cursus is ook het zogenaamde **reisverslag** toegevoegd. Jullie mogelijk reeds bekend uit de BIT. Het reisverslag wordt niet gebruikt voor zelfreflectie, maar als hulpmiddel om de theorie eigen te maken. Er worden open vragen gesteld, waar de deelnemer zelf aan de hand van de theorie een antwoord op dient te formuleren. Bij de ene helft van de klassen wordt de kandidaat gevraagd voor zichzelf een uitleg te formuleren, bij de andere helft wordt gevraagd samen te vatten wat hij/zij van dat specifieke stukje theorie geleerd heeft. De antwoorden zijn alleen voor de trainer en de kandidaat zelf zichtbaar. Er wordt geen waardeoordeel aan de antwoorden gehangen. De inhoud van de antwoorden is niet van belang voor de onderzoek analyses, het gaat om het denkproces dat door de vragen ingang wordt gezet.
2. Er zijn twee korte kennistoetsen toegevoegd. Een die de kandidaten maken voor dat ze de theorie bestuderen, een die zij maken nadat ze alle stof en opdrachten hebben doorlopen. Deze toets is informeel. Dat wil zeggen dat het gebruikt wordt om vooruitgang en effect van de ingezette online hulpmiddelen (het reisverslag) te kunnen aantonen en niet om een 'eindcijfer' te geven.

Wat is er anders op de Traningsdag?

Er is een feedbackformulier toegevoegd aan het eind van de cursus. Dit is zowel een onderdeel van het onderzoek, als een wens vanuit Crew Training om de cursus te kunnen optimaliseren aan de hand van feedback. Dit formulier kan met de kandidaten gedeeld worden via de volgende link: Klik hier

Verder is de trainingsdag is niet anders dan normaal. Mochten er vragen zijn over de aard van het onderzoek kunt u verwijzen naar de debriefing die deelnemers na afloop hebben ontvangen (ook bijgevoegd in de bijlage) of hen contact op laten nemen met de onderzoeker via robbie.janssen@klm.com.

Wat wordt er verder van mij verwacht?

U als instructeur hoeft in principe niets anders te doen gedurende het onderzoek ten opzichte van normaal. Het staat u vrij om de ingevulde 'reisverslagen' te bekijken en dit te gebruiken om te kijken welke onderwerpen goed of minder goed begrepen worden en om een indruk te krijgen van hoe serieus de deelnemer met de theorie bezig is geweest.

Bij voorbaat wil ik u bedanken voor uw medewerking, ook namens de KLM en de Universiteit Leiden. U helpt mij afstuderen en u helpt KLM bij het optimaliseren van deze en aankomende PCD-modules.

Mocht u vragen over het onderzoek hebben schroom dan niet op contact op te nemen met mij via robbie.janssen@klm.com. Ook als u feedback of ideeën heeft over de inzet van het reisverslag na het onderzoek kunt u op dit e-mailadres terecht. Wilt u een klacht indienen over de wijze van onderzoek dan kan dit bij Guido Band (band@fsw.leidenuniv.nl) namens de afdeling Cognitieve Psychologie van de Universiteit Leiden.

Met vriendelijke groet,

Robbie Janssen
Robbie.janssen@klm.com
0657538737