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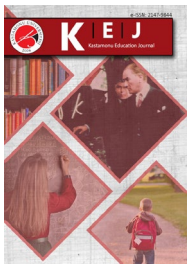

| Research Article / Araştırma Makalesi |

An Investigation of the Learners' Personalized Feedback Paths Based on E-Assessment

Öğrenenlerin E-Değerlendirmeye Dayalı Kişiselleştirilmiş Geri Bildirim Yollarının İncelenmesi[1]

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Keywords

1. Feedback
2. Personalized feedback
3. Personal characteristics
4. E-assessment

Anahtar Kelimeler

1. Geri bildirim
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Abstract

Purpose: The purpose of the research is to investigate personalized feedback paths of learners based on e-assessment according to the feedback preferences of learners and their needs.

Methodology: The design-based research method consisting of two stages was used in this study. The study group comprised of 36 undergraduates in the department of Computer and Instructional Technology in the Education Faculty in one of the state universities was determined based on criterion sampling method. The data collection process has carried out with the same study group at both design stages by using blended learning method. Data collection tools are consisted of Motivation and Metacognition scales, learning management system records and semi-structured interview form. The descriptive analysis methods, Chi-Square independence test, multiple correspondence analysis, and content analysis have been used for data analysis.

Findings: According to the findings of the research, the effect of test anxiety and extrinsic goal orientation from motivation sources, metacognition, the judgment of learning and task level variables have determined on feedback preferences of the learner. Classify by these characteristics, a number of personalized feedback strategies have been developed based on the learner's preferences and needs for feedback. In addition, it was found that learners wanted to get feedback from teachers rather than peers because they found teacher's feedback more qualified and they did not trust their peers' feedback.

Highlights: In order to use the personalized feedback strategies developed in the research in different research groups and training programs, it should be important that the system is similar to those in this study. These should be similar systems that determine both the learner's preference and the needs for feedback according to the learner characteristics to support learning performance. Otherwise, it is thought that will be out of the context of personalization.

Öz

Çalışmanın amacı: Araştırmanın amacı, öğrenenlerin e-değerlendirmeye dayalı geri bildirim tercihleri ve ihtiyaçlarına göre kişiselleştirilmiş geri bildirim yollarını incelemektir.

Yöntem: Araştırmanın yöntemi iki aşamadan oluşan tasarım tabanlı araştırmadır. Bir Devlet Üniversitesi'nin Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi bölümündeki 36 öğrenenden oluşan çalışma grubu, ölçüt örnekleme yöntemi ile belirlenmiştir. Veri toplama süreci her iki tasarım aşamasında aynı çalışma grubu ile harmanlanmış öğrenme yöntemi kullanılarak gerçekleştirilmiştir. Güdülenme ve Üstbiliş ölçekleri, öğrenme yönetim sistemi kayıtları ve yarı yapılandırılmış görüşme formu veri toplama araçlarıdır. Verilerin analizinde betimsel analiz teknikleri, Ki-Kare bağımsızlık testi, Çoklu Uyum analizi ve içerik analizi kullanılmıştır.

Bulgular: Araştırma bulgularına göre güdülenme kaynaklarından sınav kaygısı ve dışsal hedef düzenleme ile üstbiliş, öğrenme kararı ve görev seviyesi değişkenlerinin öğrenenin geri bildirim tercihinde etkisi belirlenmiştir. Bu özelliklere göre sınıflama yapılarak, öğrenen hem geri bildirim tercihine hem de ihtiyacına yönelik birtakım kişiselleştirilmiş geri bildirim stratejileri oluşturulmuştur. Ayrıca öğrenenlerin öğretmen geri bildirimini daha nitelikli bulmaları ve akranların geri bildirimlerine güvenmemeleri nedeniyle akran yerine daha çok öğretmenden geri bildirim almak istediği bulunmuştur.

Önemli Vurgular: Araştırmada geliştirilen kişiselleştirilmiş geri bildirim stratejilerini farklı araştırma grupları ve eğitim programlarında kullanmak için, sistemin bu çalışmadakine benzer olması önemlidir. Bunlar, öğrenenin hem geri bildirim tercihini hem de öğrenme performansını destekleyecek geri bildirim ihtiyacını, öğrenen özelliklerine göre belirleyen sistemler olmalıdır. Aksi takdirde kişiselleştirme bağlamından uzaklaşılacağı düşünülmektedir.

[1] This study was produced from the first author's doctoral thesis under the supervision of the second author.

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INTRODUCTION

With the increasing impact of technology on education, learning for the individual now goes beyond the walls of the classroom, and besides formal education learning is continued non-formally, without interruption. Within the scope of Information Technologies and Software curriculum, MoNE (2018a, p. 6) emphasized that a measurement and assessment process that behaves with the principles of "suitable for everyone", "valid and standard for everyone" is against human nature. At this point, new technologies allow us to rethink and discover the ways of evaluating learning. The concept of e-assessment has emerged with the inclusion of technology-based tools in the assessment process and has started to become the subject of the research. E-assessment is the use of information technologies in all activities from the beginning to the end of the assessment process (Cabi, 2016, p. 95). E-assessment allows learners to self-organize and monitor their own learning by carrying out all the processes by storing their own learning tools individually, receiving and sending feedback, presenting and reflecting their learning progress. In this way, it helps in providing more meaningful and effective learning (JISC, 2010, p. 53-55).

In Turkey's 2023 education vision, teachers are expected to analyze e-assessment data in a qualified and detailed way, and to use this data in the organizing learning platform and planning new learning (MoNE, 2018b). Thus, giving feedback, which is one of the important components of the learning process, will be an effective way. Since feedback is a regulatory mechanism that allows the learner to close or reduce the gap between real and targeted knowledge (Black & Wiliam, 1998, p. 47). The study of Butler, Karpicke and Roediger (2008, p. 918) proved that the feedback including the correct answer is useful in correcting memory and metacognition-based errors and emphasized that it is a regulatory mechanism. The type and amount of information contained in the feedback message change the effectiveness of the feedback provided such as confirmation messages that provide information about whether the answer is correct such as yes-no, true-false, etc., and elaboration messages that provide clue, explanation, or example about the content of the answer using a conjunction, (Shute, 2008, p. 158). Butler, Godbole and Marsh (2013, p. 290) examined the usefulness of the additional information provided in the feedback message along with the correct response information and found that such feedback provides equal performance in repetitive questions, but they are very useful in transferring learning into new questions.

Apart from the research conducted about the effectiveness of feedback in learning and the information contained in the feedback messages, the relationship between the feedback and personal characteristics is also one of the compelling topics. In this sense, the personal characteristics that affect feedback, such as gender and prior knowledge, can play a role in the effectiveness of feedback (Narciss et al., 2014, p. 59). Smits, Boon, Sluijsmans and Van-Gog (2008, p. 190) reported that even though feedback containing a lot of information is more effective on the learners with high prior knowledge, more learning occurs in the feedback containing less information. Shute (2008, p. 174), on the other hand, made suggestions about the most appropriate feedback to be communicated according to the personal characteristics. Accordingly, immediate corrective or supportive feedback should be provided to unsuccessful learners without delay; whereas delayed, confirmatory feedback or feedback including clues facilitating the content that challenges the learner should be communicated with successful learners. In addition to gender, level of learning and achievement, metacognition skills such as motivation, self-efficacy and self-regulation were also addressed in the studies about the effectiveness of the feedback process, as important variables (Mory, 2004, p. 773-775; Narciss, 2008, p. 134; Schartel, 2012, p. 85).

The feedbacks adapted to the personal characteristics given in the e-assessment environment should be used by the learner at the desired time and place, which is an important stage expected to occur in learning (JISC, 2007, p. 16).Thus, personalized feedbacks given during the learning process can be used (Narciss, 2008, p. 126). Personalized feedback is a method that will strengthen the teacher to see the learning deficiencies, monitor their own development, organize the next learning process and support the learner to maximize the learning (Narciss et al., 2014, p. 59). In this respect, it is thought that an e-assessment system used to provide feedback by the teacher will be very useful to increase the time allocated to learning and to support learning (Bahar, 2014, p. 40).

In this study, the question of " which feature to increase learning performance of learners, what information will he/she need in the feedback message?" was addressed. It is thought that a research that will be developed to answer this question will contribute to the following literatures: research methods on the use of design-based research that helps develop educational practices; and personalized learning environments and feedback on drawing a framework for creating personalized feedback strategies. In this context, the purpose of the research is to investigate personalized feedback paths of learners based on e-assessment according to the feedback preferences of learners and their needs. For the variables that will create personalized feedback (PF) paths, a model prepared by the researcher as a result of the literature readings was used (Figure 1).

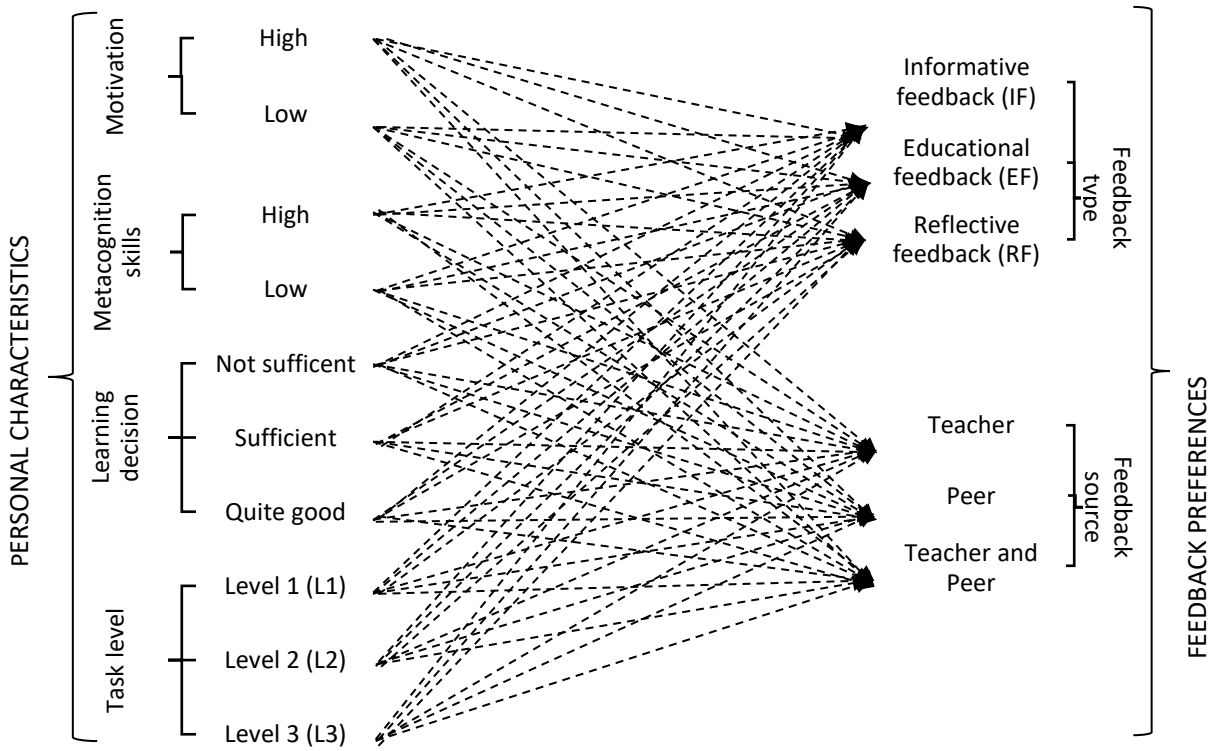

Figure 1. Personalized feedback strategy generation model

Huisman, Saab, Van Driel and Van den Broek (2018) have found that learners learn both from receiving peer feedback and from providing feedback. Therefore within the framework of the model created in Figure 1, the feedbacks were diversified according to the message content, namely informative (IF), educational (EF) and reflective feedback (RF), and also according to the source as teacher or peer. On the other hand, the personal characteristics of learners were examined in terms of motivation and metacognition skills, which can affect the decisions of the learners about feedback preferences. Metacognition, which is a form of metacognitive monitoring about the learning performance level of the learner, is an umbrella term that includes learning decision variables (Tabakçı & Karakelle, 2010, p. 55). On the other hand, learning decisions significantly affects the progressive learning process (Hu, Liu, Li & Luo, 2016, p. 383). For these reasons, besides motivation and metacognition, learning decision and task level variables were also included in the model in addition to the personal characteristics. The dashed lines in the model are used to indicate whether the determined path will be considered as a strategy at the end of the research. Depending on r these dashed lines to be accepted as a strategy, it is expected that the most preferred feedbacks are based on learners' personal characteristics, also should increase the learning performance as well. Within the framework of this model, the questions addressed in the research are as follows:

1. What are the feedback preferences of learners based on their personal characteristics?
    a. What is the feedback type preferences of learners based on their personal characteristics?
    b. What is the feedback source preferences of learners based on their personal characteristics?
2. What are the effects of feedback type preferences on learning performance based on the personal characteristics?
3. What are the learners' opinions on personalized feedback?

METHOD

In this research, a design-based research method consisting of design, analysis and redesign (Shavelson, Phillips, Towne, & Feuer, 2003, p. 26) steps was used. Design-based research is a research method used especially for the development of educational practices through repeated reviews in a systematic and flexible structure (Barab & Squire, 2004; Han & Bhattacharya, 2001; Wang & Hannafin, 2005, p. 5-6). In the first design of the research, the main problem is to determine feedback preferences according to the personal characteristics of the learners. The main problem of the second design is to analyze learner performances according to the feedback preferences set in the first design and get the opinions of the learners about PFs.

Participants

Participants were determined by criterion sampling, one of the purposeful sampling methods. Criteria sampling including all cases or individuals who have met some criteria considered important to improve the quality of the study (Patton, 1990, p. 176). This study is based on the criterion that learners are experienced in using a learning management system. According to this criterion, the participants consisted of 36 sophomore learners, 15 girls and 21 boys, who were studying in the Faculty of Education, Department of Computer Education and Instructional Technology was used.

Data Collection Tools

The data collection tools of the first design which were Motivation and Metacognition Scales and learning management system records used to determine the personal characteristics of the learners. Motivation scale is a seven-point Likert type scale developed by Pintrich, Smith, Garcia and McKeachie (1991) and adapted to Turkish by Büyüköztürk, Akgün, Özkahveci & Demirel (2004, p. 232). The scale has a modular structure and can be used as sub-scales as in this research (Pintrich, Smith, Garcia & McKeachie, 1993, p. 801). Metacognition Scale developed by Altındağ (2008, p. 44) is a five-point Likert-type scale consisting of 30 items with both one-dimensional and multi-dimensional features (Altındağ & Senemoğlu, 2013, p. 15). In the learning management system, data is recorded through the weekly work plan, e-assessment task and e-rubrics. These records include the data of personal learning decision and task level, learner feedback preferences, learner preferences regarding e- assessment tasks and learner performances.

The data collection tools of the second design were the semi-structured interview form prepared by the researcher to collect data, and the records of the learning management system. Semi-structured interview form consists of 6 questions prepared by the researcher. The opinions of two different experts about the applicability of the questions in the interview form were asked and a pilot interview was conducted with a learner from the study group. The learner participating in the pilot interview was excluded from the interview data. In addition, the scales used in the first design were not reused in the second one, however the data of motivation and metacognition scales were used in the second design.

Implementation

CANVAS learning management system has been used in both designs of the research because of its simple interface, ease of assessment of learners' tasks and ease of sending personalized feedback. The learners attended face-to-face courses, for seven weeks in the first design and four weeks in the second design with the same study group and completed weekly e-assessment tasks related to the concepts of the course on CANVAS. At the beginning of the first design, learners took an orientation and filled the scales, as well as the participating approval form in the research. The learners, who started to use the system, chose the task they want to take, the level of the task and the feedback type and source they want to take for their weekly courses. The components of the first design implementation material are summarized in Figure 2.

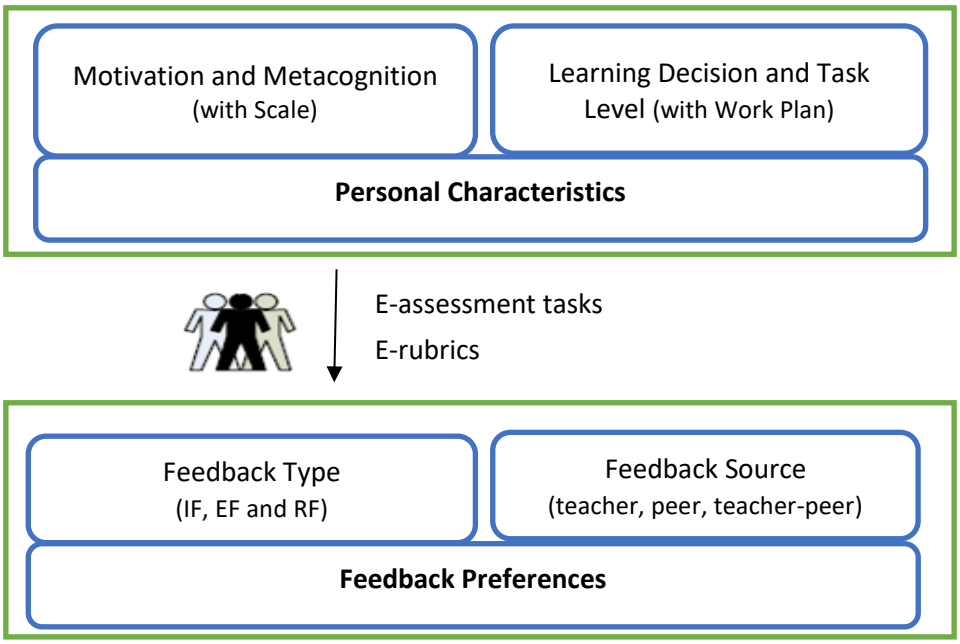

Figure 2. Implementation material

According to Figure 2, the implementation material is comprised of the following components:

(i). Weekly work plan: In the work plan, the learner evaluates the learning decision about how much he/she learned the concepts covered in the lesson, on three levels: "sufficient", "not sufficient" and "quite good". The learners were asked to consider their ability to answer repetition questions about the instructed concepts at the end of the lesson while determining the learning decision. After the learning decision, he/she specifies the concept of the task and the task level consisting of three levels. Each week, learners were assigned to the assessment tasks to be completed individually, based on their preferences in the work plan.

(ii). E-assessment tasks: These performance-based tasks were prepared at three different levels by the researcher and the lecturer. Cognitive processes of Bloom taxonomy were used to group e-assessment tasks according to their difficulty levels (Bümen, 2006, p. 5). According to this taxonomy, the tasks were classified as follows: L1 Recall-Understanding, L2 Practice-Analysis, and L3 Assessment-Creation.

(iii). Feedback preference survey: After completing the e-assessment task, the learners notify the feedback type they want to get and the feedback source via feedback preference survey. In this questionnaire, three different feedback types, namely informative, educational and reflective, were offered to the learners; and "teacher", "peer" or "both teacher and peer" options are offered as feedback sources. Learners asking for peer feedback are evaluated by another learner who is assigned to the same task. In this way, those who complete the same task take the role of evaluative peers for the other and their names are hidden in the system.

(iv). E-rubrics: E-rubrics include the assessment criteria for the e-assessment task prepared by the researcher and the lecturer. E-rubrics are analytical rubrics based on four criteria: "Totally wrong information", "Wrong and unnecessary information", "True but incomplete information" and "All information is correct and necessary". According to the choices made by the learners in the feedback preference survey, e-rubrics were used by both the teacher and the peer in scoring. In addition, peers are guiding by writing a feedback message. Besides peers, the researcher teacher is the person who communicated feedback messages. The researcher used both e-rubrics and feedback sending format for this and wrote messages addressing each learner with his/her name.

Although the implementation material of the second design was the same as the first one, it was revised according to the learner feedback preferences and some modifications were made. Peer feedback, level 3 assessment tasks and reflective feedback type, which were not preferred by the learners, have been removed from the second design material. In addition, the learning decision options in the work plan has been reduced to two, as "sufficient" and "not sufficient". This time the focus was not learners' feedback preferences, thus feedback preference survey was removed. The feedback type they preferred the most in the first design was communicated with the learners by the teacher. Another important change was the provision of similar repetitive tasks on the same concept. Accordingly, a total of 12 e-assessment tasks were divided into two, as first tasks and repetitive tasks.

First task: These are the e-assessment tasks that were given in the first three weeks and about which one of the most preferred feedback types (IF or EF) has been given after completion. Four tasks were sent to the learners for each of the L1 and L2 levels.

Repetitive task: These are the tasks given in the fourth week, after which no feedback has been given, and in which the tasks involving the concepts of the first three weeks were repeated. Four repetitive tasks at L2 level were sent to the learners.

The first and repetitive tasks involving the same concept were scored as correct answer (1) and wrong answer (0) via e-rubric. In this way, whether the learners corrected the wrong answer of the first task, in the repetitive task was examined. Accordingly, the contribution of the feedback type communicated after the first task to the correction of the answer at the repetitive task was interpreted. At the end of the second design, interviews were conducted with 12 volunteer learners about their opinions on PF. Of these learners, who participated in e-assessment tasks in both designs, 6 preferred EF and the other 6 preferred IF for the tasks they completed.

Data Analysis

In the data analysis of the first design, descriptive analysis techniques, Multiple Correspondence Analysis and Chi-square independence test were used to investigate learner profiles related to feedback preferences. Multiple correspondence analysis was used for the following purposes (Husson & Josse, 2014, p. 163).

(i). Deriving the typology of the individuals, in other words working on the similarities between individuals.

(ii). Evaluate the relationship between variables and explore the relationship between categories.

(iii). To examine the association of connections to characterize individuals with a number of variables.

The purpose of using this analysis in this paper was to investigate learner profiles by characterizing their feedback preferences based on their personal characteristics. Chi-Square independence test was used to check whether the relationship (difference between observed and expected frequencies) between two qualitative variables is statistically significant (Güngör & Bulut, 2008, p. 84).

In the second design data analysis, it was aimed to determine the effect of feedback type preferences of the learners, who were grouped according to personal characteristics, on their learning performance. However, due to the low number of learners and the fact that all learners did not participate in all related tasks, a statistical difference test was not performed for measuring the effectiveness or significance of learning performance of each feedback type. Instead, the average correct answer of the learners in the repetitive tasks based on the feedback type preferences were interpreted as bar graphs. Content analysis was also used in the data analysis of the second design to analyze the interview data obtained for PF system. In this analysis method, what is hidden in the data is revealed, and it consists of various stages such as processing qualitative data, coding and setting the themes, organizing and grouping the codes according to the themes, defining and interpreting the findings (Yıldırım & Şimşek, 2006, p. 246).

In order to synthesize the findings of the first and second design, assimilation and configuration methods were used (Voils, Sandelowski, Barroso & Hasselblad, 2008, p. 14). The findings obtained in the assimilation stage can be combined with each other, co-arranged around a theoretical model or argument consistently (Sandelowski, Voils & Barroso, 2006, p. 7). This method is possible when there are findings confirming each other or combined in the same direction. On the other hand, the findings handled in the configuration stage, are the findings that cannot be combined with each other, but complement each other, or findings that can be intertwined. Here, one finding explains the other or expands each other (Voils et al., 2008, p. 6).

Validity and Reliability of the Research

In both stages of the research, some measures have been taken to ensure validity and reliability. Accordingly, for the internal validity of the research, care taken to ensure that the methods used in the study group, data collection and analysis are consistent with the whole study and they are reported with the reasoning behind it. In order to confirm the reliability of the results, similar researches in the literature were reviewed, and the research findings were discussed and supported. For the internal reliability of the research, different data collection methods and analysis strategies were used. For the external validity of the research, direct quotations taken from the raw data were included in the presentation of the findings. It was reported that the results of the research can be generalized for similar cases and environments. For the external reliability of the research, the researcher received support from specialists for the cases that lack required expertise. The research data were stored in their original and digital form for reference.

FINDINGS

Feedback preferences of learners were divided in two as feedback type and feedback source based on their personal characteristics. Feedback preference frequencies of learners were investigated according to the task levels completed by the learners in the first design (Table 1).

Table 1. Feedback preference frequencies of learners according to the task levels

Feedback Type	Feedback Source	L1	L2	L3	Total
Informative Feedback (IF)	Teacher	125	31	1	157
	Teacher-Peer	18	4	0	22
	Total	143	35	1	179
Educational Feedback (EF)	Teacher	60	42	1	103
	Teacher-Peer	27	24	0	51
	Total	87	66	1	154
Reflective Feedback (RF)	Teacher	7	2	0	9
	Teacher-Peer	10	5	0	15
	Total	17	7	0	24
Total		**247**	**108**	**2**	**357**

According to Table 1, 36 learners completed 357 tasks in total, and reflective feedback was preferred only in 24 of them and Level 3 was preferred only in 2 of them. On the other hand, no learner wanted to receive peer feedback alone. For this reason, these variables are not reported in the findings.

Feedback Type Preferences of Learners

The findings of multiple correspondence analysis of learners' feedback type preferences according to the motivation source and metacognition variables are given separately for L1 and L2 tasks in Figure 3a and Figure 3b.

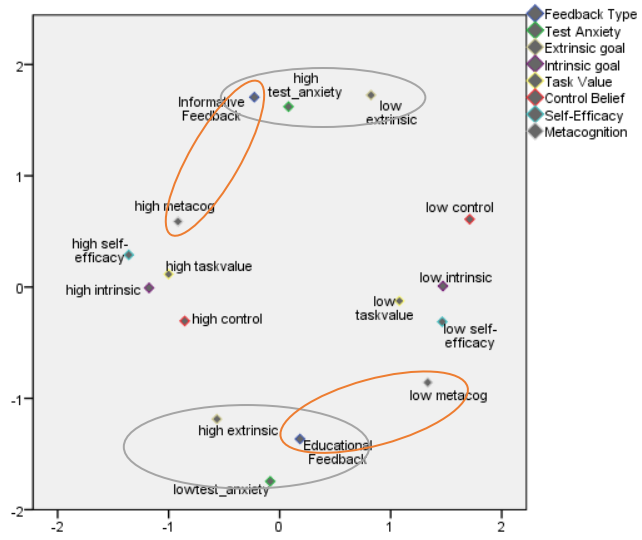

Figure 3a. The results of multiple correspondence analysis of feedback type for L1

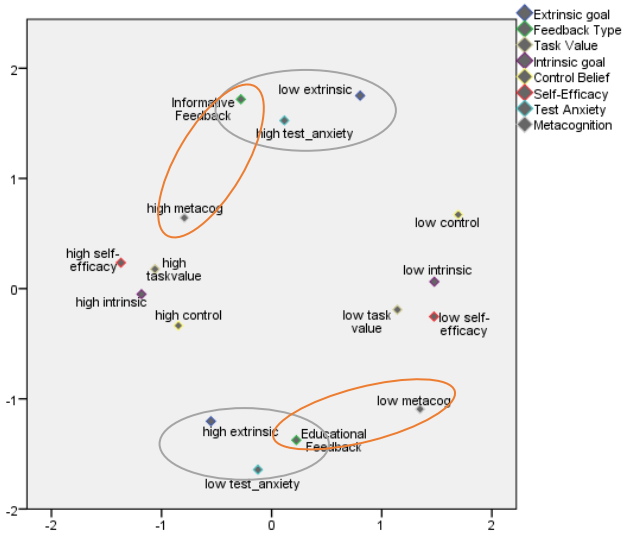

Figure 3b. The results of multiple correspondence analysis of feedback type for L2

As seen in the figures, the results of Multiple Correspondence Analysis for feedback type preferences are similar for L1 and L2 tasks. In this sense, the findings of the tasks at recall-understanding and practice-analysis levels support each other. Accordingly, the variables that have the highest correlation with feedback type were observed to test-anxiety and extrinsic goals from motivation sources, and these variables act together with feedback type. On the other hand, self-efficacy, task value, intrinsic goals and control belief variables from motivation sources were observed to be grouped together and they were independent of feedback type. This means that, regardless of the feedback type preference, if one of these characteristics is high in one learner, the other three are observed to be high as well. Therefore, regarding feedback type preferences of learners it can be said that those with high test anxiety and low extrinsic goals prefer IF, whereas those with low test anxiety and high extrinsic goals prefer EF. Regarding metacognition, which is another variable highly correlated with feedback type, those with higher metacognition skills tend to choose IF and those with low metacognition skills tend to choose EF.

Other personal characteristics that were addressed in feedback type preferences were learning decision and task level. These variables were first addressed separately. Accordingly, Pearson Chi-Square results are statistically significant with an effect size of 0.13 ($\chi2 = 6.20$, SD = 2, p=0.04 <0.05) for learning decision and feedback preferences; with an effect size of 0.25 for task level and feedback preferences ($\chi2 = 21.38$, SD=1, p = 0.00 < 0.05). In this case, regardless of the level of the task, learners who think that they are sufficient or quite good at learning prefer IF type, while those who think that they are not sufficient prefer EF, although the preferences are close to each other. Learners who take recall-understanding level tasks prefer IF, and those who take practice-analysis level assessment tasks prefer EF.

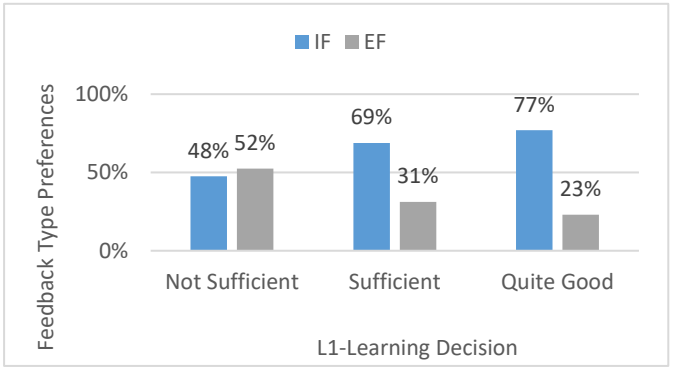

Figure 4a. Feedback type preferences according to L1 and learning decision

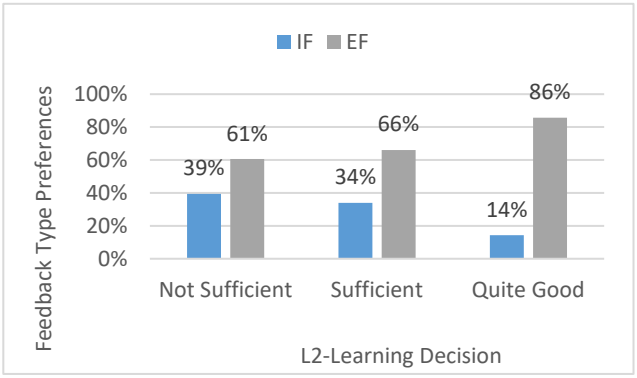

Figure 4b. Feedback type preferences according to L2 and learning decision

Regarding the grouping of the learning decision according to task level, Chi-Square results are statistically significant only for L1 learning decision and feedback type with an effect size of 0.23 ($\chi2 = 12.164$, SD = 2, p = 0.002 <0.05) (Figure 4a). Chi-Square results between L2 learning decision and feedback type ($\chi2 = 1.68$, SD = 2, p = 0.43> 0.05) are not significant (Figure 4b). In this

case, those who believe that their learning is sufficient or quite good in recall-understanding level tasks prefer IF, while those who think that their learning is not sufficient prefer EF, although the preferences are close to each other.

Feedback Source Preferences of Learners

Multiple Correspondence Analysis results between learners' feedback source preferences according to the motivation source and metacognition variables are given separately for L1 and L2 tasks in Figure 5a and Figure 5b.

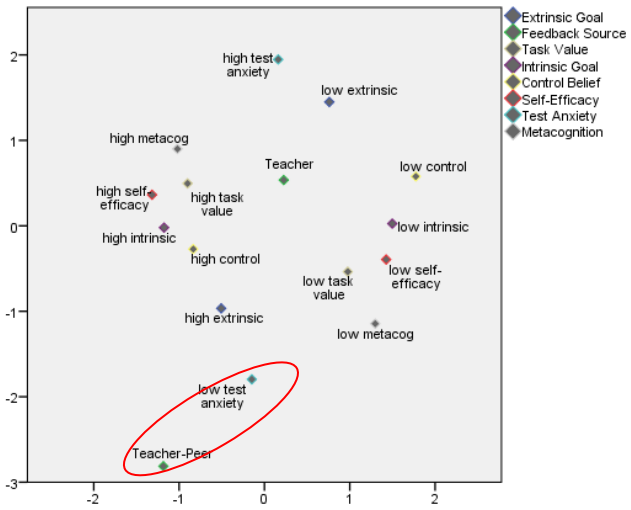

Figure 5a. The results of multiple correspondence analysis of feedback source for L1

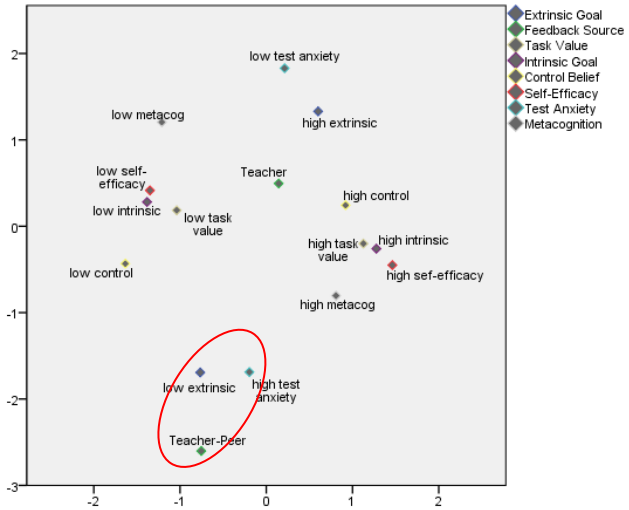

Figure 5b. The results of multiple correspondence analysis of feedback source for L2

As seen in Figures 5a and 5b, at some point Multiple Correspondence Analysis results of feedback source preferences differ for L1 and L2 tasks. Accordingly, in recall-understanding level, namely L1, learners who have low test anxiety prefer teacher-peer feedback; whereas in practice-analysis level, namely L2, those who have this preference are the ones with high test anxiety and low extrinsic goals. On the other hand, all other variables are grouped around the feedback from the teacher.

Other personal characteristics that were addressed in feedback source preferences are learning decision and task level; their Chi-Square independence test results are illustrated (Figure 6a; 6b).

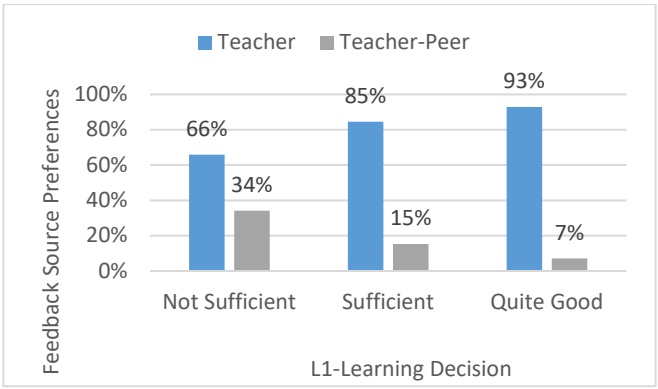

Figure 6a. Feedback source preferences according to L1 and learning decision

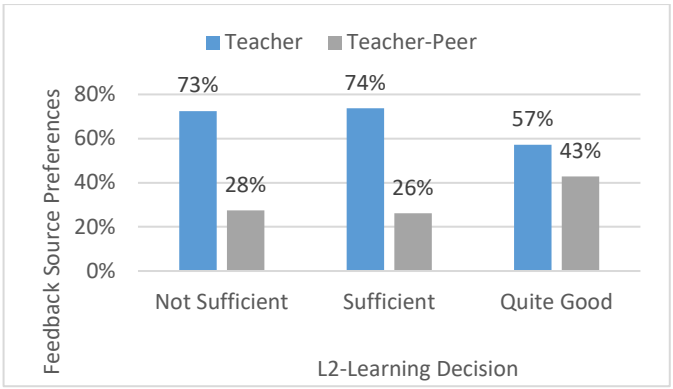

Figure 6b. Feedback source preferences according to L2 and learning decision

Regarding the grouping of the learning decision according to task level, Chi-Square results are statistically significant only for L1 learning decision and feedback source with an effect size of 0.25 ($\chi2=15.2$, SD=2, $p=0.00 < 0.05$) (Figure 6a). Chi-Square results between L2 learning decision and feedback source ($\chi2=0.86$, SD=2, $p=0.65 > 0.05$) are not significant (Figure 6b). In this case, learners in recall-understanding level tasks want to get feedback from the teacher regardless of the learning decision.

Learning Performance According to Feedback Type Preferences of Learner's

To examine the effect of feedback type preference, which were determined according to the personal characteristics of learners, on learning performance, first of all the percentages of tasks completed by learners in the second design is given (Table 2).

Table 2. Percentages of completed tasks in the second design

Feedback Type	First Task		Repetitive Task
	L1	L2	L2
IF	0.44 (10)	0.13 (3)	0.57 (13)
EF	0.17 (4)	0.26 (6)	0.43 (10)
Total	**0.61(14)**	**0.39 (9)**	**1.00 (23)**

Note. Frequencies are given in parentheses.

According to Table 2, in the L1 tasks of the second design, IF were sent to 44% of learners for the first completed task, and EF were sent to 17% of them. Regarding L2 tasks, IF were sent to 13% of learners for the first completed tasks, whereas EF was sent to 26%. Accordingly, 57% of the repetitive tasks submitted to test the first completed task were completed after IF and 43% after EF.

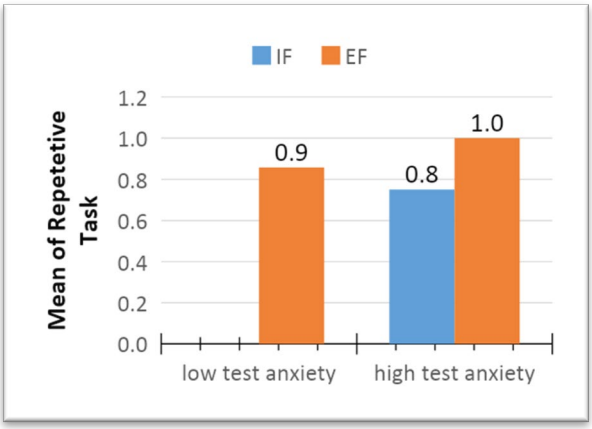

Figure 7a. Mean of repetitive task according to test anxiety

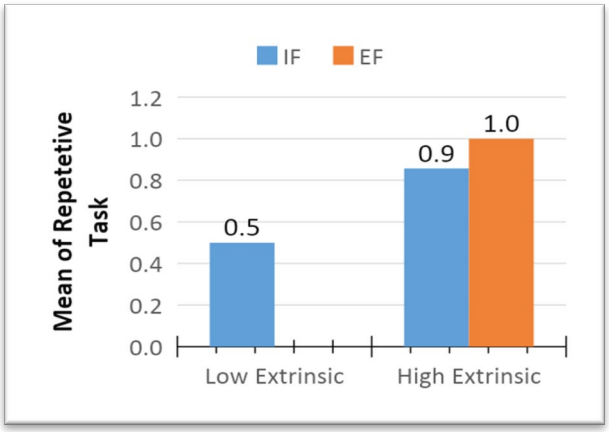

Figure 7b. Mean of repetitive task according to extrinsic goal

About feedback type preferences of learners based on motivation sources, it was found that students with high test anxiety and low extrinsic goals prefer IF, whereas those with low test anxiety and high extrinsic goals preferred EF. The average correct answers in the repetitive task is higher when learners get EF compared to IF, whether their test anxiety is low or high (Figure 7a). On the other hand, learners with low extrinsic goals achieve more correct answers when they get IF, whereas this rate is higher for those with higher extrinsic goals when they get EF (Figure 7b). Accordingly, the feedback type preference of learners with low test anxiety and high extrinsic goals is also supported by the learning performance graph. However, feedback type preference of learners with high test anxiety and low extrinsic goals is not consistent with their learning performance.

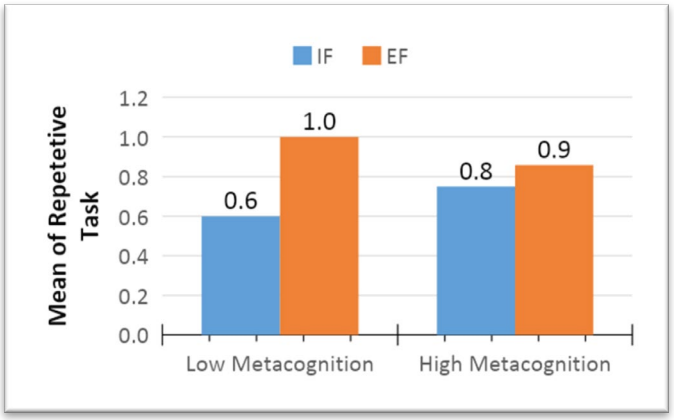

Figure 8. Mean of repetitive task based on metacognition

About feedback type preference of learners based on the metacognition, it was found that learners with higher metacognition skill prefer IF and those with higher metacognition skill prefer EF. The average correct answers in the repetitive task is higher when learners get EF compared to IF, whether their metacognition skill is low or high (Figure 8). Accordingly, only the feedback type preference of learners with low metacognition is supported by the learning performance graph. However, although those who have higher metacognition skill are observed to prefer IF, it can be said that they achieve more performance after EF with a small margin.

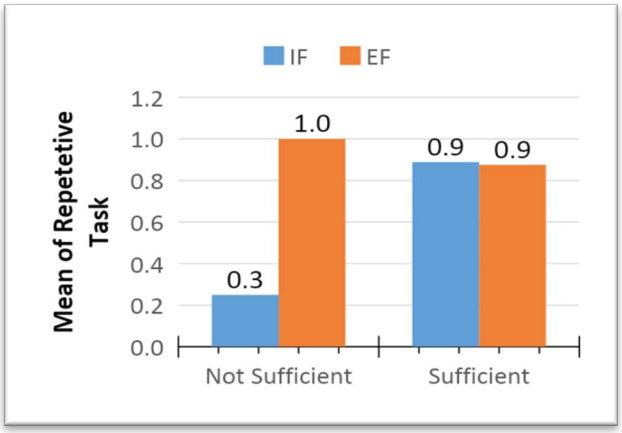

Figure 9a. Mean of repetitive task based on learning decision

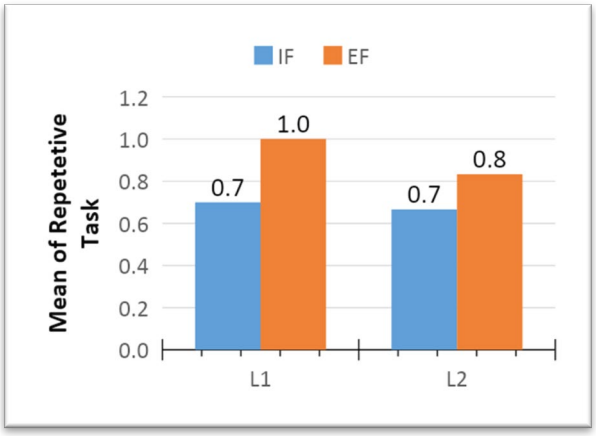

Figure 9a. Mean of repetitive task based on task level

About feedback type preference of learners based on the learning decision, it was found that learners with insufficient learning prefer EF more and those with sufficient learning prefer IF more. According to the learning performance graph in Figure 9a, the average correct answers of learners with insufficient learning in the repetitive task is higher when they get EF compared to IF. On the other hand, the average correct answer of learners with sufficient learning are similar either they get IF and EF. In this case, feedback type preference of learners according to learning decisions was also supported by the learning performance graph.

About feedback type preference of learners based on the task level, it was found that learners prefer IF in L1 tasks and EF in L2 tasks. According to the learning performance graph in Figure 9b, the average L1 and L2 correct answers in the repetitive task is higher when they get EF compared to IF. Accordingly, feedback type preference of learners for L2 tasks is supported in the learning performance graph; whereas these preferences are observed to be inconsistent with learning performance for L1 tasks. On the other hand, learners with sufficient learning in L1 tasks prefer IF and those with insufficient learning prefer EF. The average correct answers of learners whose learning decision is sufficient in L1 tasks are equal after both IF and EF, whereas those who have insufficient learning showed better learning performance after EF. In this way, feedback preference of the learners' in L1 tasks are also supported by the learning performance.

Synthesis of the Findings

Table 3 shows the process of synthesizing the findings regarding whether the findings of the first and second design are confirmatory, complementary (explanatory), or distance from each other. Accordingly, if a finding in the first design agrees with or confirms a finding of the second design, it is coded as [CONF #finding]. If two findings are complementary, expansive or explanatory, they are coded as [COMP #finding], but the findings that are not compatible or explaining each other. These findings coded as [DIS #finding] because they are distant from each other. In this table, findings on qualitative data are also combined.

Table 3. Synthesized the findings of the first and second design [Confirmatory (CONF), Complementing (COMP), or Distance from (DIS) each other]

	Feedback Type Preferences		**Learning Performance**	
	IF [#finding]	*EF [#finding]*	*IF [#finding]*	*EF [#finding]*
Set A	1. High test anxiety –Low extrinsic goal & L1 [CONF #2; COMP #5; DIS #6]	3. Low test anxiety –High extrinsic goal & L1 [CONF # 4; COMP #8, 7]		6. High test anxiety *(IF_{mean}=0.8 < EF_{mean}=1)* [DIS #1, 2] 7. Low test anxiety *(IF_{mean} =0 < EF_{mean}=0.9)* [COMP #3, 4]
	2. High test anxiety –Low extrinsic goal & L2 [CONF #1; COMP #5; DIS #6]	4. Low test anxiety –High extrinsic goal & L2 [CONF #3; COMP #8, 7]	5. Low extrinsic goal *(IF_{mean}=0.5 > EF_{mean}=0)* [COMP #1, 2]	8. High extrinsic goal *(IF_{mean} =0.9 < EF_{mean}=1)* [COMP #3, 4]
Set B	9.High Metacognition & L1 [CONF #10; DIS #14]	11. Low Metacognition & L1 [CONF # 12; COMP #13]		13. Low Metacognition *(IF_{mean}=0.6<EF_{mean}=1)* [COMP #11,12]
	10. High Metacognition & L2 [CONF #9; COMP #14]	12. Low Metacognition & L2 [CONF #11; COMP #13]		14. High Metacognition *(IF_{mean} =0.8 < EF_{mean}=0.9)* [DIS #9, 10]
Set C	15. L1 *(IF_{perc}=62% > EF_{perc}=38%) (χ^2=21.38, p=0.00*)* [CONF #23; COMP #23, 25; DIS#17, 24, 26]	16. L2 (*IF_{perc}=35% < EF_{perc}=65%) (χ^2=21.38, p=0.00*)* [COMP #18]		17. L1*(IF_{mean} =0.7 < EF_{mean} =1)* [DIS #13] 18. L2 *(IF_{mean} =0.7 < EF_{mean} =0.8)* [CONF #15; COMP #14]
Set D	19. Sufficient or Quite good *(IF_{perc}= 58%; 64% > EF_{perc} = 42%; 36%) (χ^2=6.2, p=0.04*)* [CONF #23; COMP #21, 25]	20. Not sufficient *(IF_{perc}= 45% < EF_{perc} =55%) (χ^2=6.2, p=0.04*)* [CONF #24; COMP #22, 26]	21. Sufficient *(IF_{mean} = EF_{mean} =0.9)* [CONF #25, COMP #19, 23]	22. Not sufficient *(IF_{mean} =0.3< EF_{mean} =1)* [CONF # 26, COMP #20, 24]
Set E	23. L1 & Sufficient; L1 & Quite good *(IF_{perc}=69%; 77% > EF_{perc}=31%; 23%) (χ^2=12.16, p=0.00*)* [CONF #15, 19; COMP #21, 25; DIS #17]	24. L1 & Not sufficient *(IF_{perc}= 48% < EF_{perc}= 52%) (χ^2=12.16, p=0.00*)* [CONF # 20; COMP #22, 26; DIS #15, 17]	25. L1 & Sufficient *(IF_{mean} = EF_{mean} = 1)* [CONF #15, 19; COMP #23; DIS #17]	26. L1 & Not Sufficient *(IF_{mean} = 0.3 < EF_{mean} =1)* [CONF #17, 22; COMP #20, 24; DIS #15]

Qualitative Findings on Feedback Preferences			**Qualitative Findings on Learning Performances**	
Task Level	*Feedback Type*	*Feedback Source*	*Effective Feedback*	*Learning Performance*
○ Learning Status (*f*=10) ○ Perception of difficulty (f=9) ○ Desire to Reinforce (*f*=4) ○ Not taking time (*f*=2)	○ Content of Message (*f* =10) ○ Task Performance (*f*=3)	○ Quality (*f* =7) ○ Reliability (*f* =7) ○ Complementarity (*f* =3)	○ Correcting mistakes – Completing shortcomings (*f* =12) ○ Repetition-Reinforcement (*f* =8) ○ Monitoring learning (*f* =2)	○ Full-Permanent learning (*f* =8) ○ Working style-Willingness to work (*f*=4) ○ Being Ready for Exams (*f* =4)

Note. p*= Significant value; IF (Informative Feedback); EF (Educational Feedback); perc (percentage); *f* (frequency)

In Table 3, learner preferences are summarized in the "feedback type preference" column, and the findings of the learning graph according to the learning performance of learner's feedback type preference are summarized in the "Learning performance" column. Regarding the results in Set A, findings 1 and 2 support each other, but these findings contradict with finding 6 and they are explained by finding 5. Likewise, findings 3 and 4 support each other, and they are explained by findings 7 and 8. Accordingly, when an EF is sent to those who have high test anxiety, more learning performance is obtained, whereas learners with low extrinsic goals showed more learning performance when they received IF. However, learners who have high test anxiety, but low extrinsic goals prefer IF. In this case, regardless of the difficulty of the task, feedback type preference of learners who have high test anxiety and low extrinsic goals is not consistent with their learning performance. On the other hand, those who have low test anxiety but have high extrinsic goals prefer EF more and their learning performances are also higher.

Regarding Set B, findings 9 and 10 support each other, but they were coded away from finding 14 because they contradict with it. On the other hand, findings 11 and 12 support each other, and they are explained by finding 13. According to this, learners who have high metacognition skills prefer IF more, although they achieve more learning performance when they get EF. In this case, regardless of the task level, the feedback type preference of learners with higher metacognition skill is not consistent with their learning performance. On the other hand, learners who have low metacognition skills prefer EF more and thus their learning performances get higher.

Regarding Set C, finding 15 is supported by finding 23 and explained by findings 23 and 25. In addition, finding 15 is distant from findings 17, 24 and 26 because it contradicts with them. Finding 16 is explained by finding 18. Accordingly, although learners in L1 recall-understanding tasks achieve more learning performance when they get EF, they prefer IF more. In this case, feedback type preference of learners in recall-understanding tasks is not consistent with their learning performance. On the other hand, learners in L2 practice-analysis tasks prefer EF more and thus their learning performances get higher.

Regarding Set D, finding 19 is supported by finding 23 and explained by findings 21 and 25. Finding 20 is supported by finding 24 and explained by findings 22 and 26. Accordingly, learners who think that they are sufficient or quite good in learning prefer IF more and their learning performance is higher. Similarly, learners who think that they are not sufficient in learning prefer EF more and their learning performances are higher. In this case, learners' feedback type preferences according to the learning decision moved consistently with their learning performances.

Regarding Set E, finding 23 is supported by findings 15 and 19, explained by findings 21 and 25, and contradicts with finding 17. In addition, finding 24 is supported by finding 20, explained by findings 22 and 26, and contradicts with findings 15 and 17. Accordingly, learners who are sufficient or quite good in learning L1 recall-understanding tasks, prefer IF more and their learning performance gets higher. Likewise, those with insufficient learning in recall-understanding tasks prefer EF more and their learning performances get also higher. In this case, learners' feedback type preferences in recall-understanding tasks according to the learning decision moved consistently with their learning performances.

Regarding qualitative findings, a total of 15 codes were reached under five themes. Accordingly, learners consider the followings on their feedback preference;

- Task level, according to understanding the concept well or not (learning status, f=10); thinking that the task can be difficult (perception of difficulty, f=9); wanting to reinforce the concept although it was learned, (desire to reinforce, f=4) or not wanting to spend time on the task (not taking time, f=2).
- Feedback Type, according to the amount of information in the feedback message (the content of the message, f=10) or the performance shown after completing the task (task performance, f=3),
- Feedback source, according to getting a useful feedback message (quality, f=7), trusting the knowledge of the source because of his/her the expertise (reliability, f=7), teacher and peer feedbacks support each other (complementarity, f = 3)

In addition, learners stated that;

- The Feedbacks they received were effective because of allowing them to correct their mistakes or complete their shortcomings (f=12); making repetition or reinforcement (f=8); allowing them to monitor their own learning (f=2);
- The Feedbacks they received were effective on learning performance because of enabling full or permanent learning (f = 8); changing their working style or increasing their willingness to work (f = 4); feeling that they are ready for the exams about the concepts without any extra effort.

DISCUSSION

The review of PF strategies as a whole showed that especially educational feedback supports learning performance in both learner preference and learner needs. In addition, educational feedback brought more learning performance than informative feedback. Regarding the research results supporting this fact in the literature, Butler et al. (2013, p. 290) reported that the feedback detailed with additional information provides equal performance in repetitive questions, but they are quite useful in the transfer of the learning to new questions. Meyer et al. (2010, p. 62) found that learners who got detailed feedback in the reading comprehension test carried out better performance in a web-based teaching environment than those who got feedback indicating only the correct answer. In another study, Bozorgian and Yazdani (2021) suggested that metalinguistic explanation provided as part of the feedback to language learners' writing is conducive to a higher level of cognitive engagement and leads to better learning outcomes. In this point, a metaanalysis results showed that the impact is substantially influenced by the information

content conveyed. (Wiśniewski, Zierer and Hattie, 2020). In study, the other result is learners mostly prefer explanation feedback for tasks based on practice-analysis. Similarly, Coral and Carpenter (2020) showed that learners performed best on application questions, particularly when explanatory feedback was provided.

Learners think that they can perform complete and permanent learning with the PFs they receive, they don't have to make much effort for the exams, and there are positive changes in their working style or desire. Supporting these results, Dawson et al. (2019, pp. 33-34) stated that one of the objectives of the feedback is supporting learners to put more efforts on working better and learning more, encouraging them or making them feel better about their own work. In addition, Shute (2008, p. 166) stated that feedback can be a powerful motivation tool when communicated as a response to targeted efforts. On the other hand, Woods (2015, p. 39) emphasized that in order to get the most benefit from the feedback, learners should convert it into thoughts and reflect it on their behavior. Accordingly, after conveying the educational feedback, the learner must read and understand it well before putting into practice. In this sense, in order for feedback to be effective, care should be taken for the features and aspects of the feedback, and each learner should internalize it. When learners were asked about the effectiveness of the feedback conveyed in this research, only one learner mentioned this important point with the following words *Actually I think it is effective ... But I am not sure about how much we processed it or added it to our notes or not.*

Mason and Bruning (2001, p. 14) provided a framework for instruction designers to decide which feedback to send in the computer-aided teaching environment. According to this framework: in easy tasks, if successful learners have high prior knowledge, then the correct answer and a supportive teaching material should be sent; however, if they have low prior knowledge, then the correct answer should be sent. In difficult tasks, if they have high prior knowledge, then a teaching material that repeats until the correct answer is achieved and that supports the correct answer should be sent; if they have low prior knowledge, then the correct answer or a feedback correcting the wrong answer should be sent. However, learners want to select the materials they know or learned well first and proceed from the easy to the difficult (Metcalfe, 2009, p. 161). These study results support the PF strategies established in the research. Learners actually need simpler feedback in their recall-understanding tasks if they know the subject well, or more detailed feedback if they think they don't know the subject well or as the task gets harder.

The results of learning decision and metacognition skills should not be considered independently. Because, metacognitive decisions play an important role in prospective metacognitive monitoring. A learner with high metacognition skill can monitor what he/she knows and can make a clear decision about it. Therefore, metacognition appears as a broad term that also covers learning decisions (Tabakçı & Karakelle, 2010, p. 55). In this sense, it is expected that those who are successful in monitoring their own learning theoretically will have good performance, because they will take the right steps in their learning decisions and choosing study topics (Callender, Franco-Watkins, & Roberts, 2016, p. 216). According to results obtained in this study, feedback preferences of learners with high metacognition skill and feedback preferences of learners who think that their learning is sufficient is consistent with each other. which is a result that should not be neglected. These are results that should not be neglected and should be investigated more detailed.

Regarding the results of the research whether the feedback should be communicated by the teacher or by the peer, learners wanted to get either teacher feedback alone or teacher and peer feedback at the same time. Peer feedback alone was not preferred at all. Because learners find teacher feedback more qualified, don't trust their peers' feedback, or think that teacher and peer feedback are complementary. Supporting this result, Cabi (2016, p. 94) reported that learners' least preferred measurement tool was peer reviews. In addition, Hattie (2012, p. 4) stated that peer feedback doesn't work effectively, emphasizing that the feedback of the peers for the works in the classroom were mostly wrong. Therefore, it was suggested that a rubric, which shows both the wrong and right paths of a task and guides in giving feedback, can help peers (Hattie, 2012, p. 4). In this research, e-rubrics were used to prevent these problems. In addition, it was thought that limiting peer feedback only with the virtual environment would be a strength in terms of interaction. But, learners nevertheless experienced mistrust against peer feedback. To take precautions against this, Wu and Schunn (2020) argued that it may simply be that explanations produced by peers were often overly terse or themselves confusing. For that they suggest that further research should investigate the quality of the explanations found in the peer comments.

CONCLUSION AND RECOMMENDATIONS

In the study, the PF strategy generation model was drawn and the dashed lines in the model to determine the personalized feedback paths. Some of these lines which are according to both learner's feedback type preference and their needs formed KM strategies. PF strategies that are created can be listed as follows:

(i). For students with low metacognitive, or for students with low test anxiety and high extrinsic goals could be sent EF.

(ii). For students with high metacognitive, or for students with high test anxiety and low extrinsic goals could be sent preference-based feedback.

(iii). For recall-understanding tasks could be sent preference-based feedback, while for practice-analysis tasks EF.

(iv). For students who believe to understand the subject in recall-understanding tasks sufficiently could be sent IF and to the others EF.

PF strategies obtained in this context can be adapted to different learning groups or different educational programs. But an important point to be considered for the PF strategies is that they can be used in the personalization of the system-like

environments within the scope of this research. These are the systems that support his/her learning performance according to both feedback preference of learners and their feedback needs. Otherwise, it is thought that the context of personalization will be withdrawn. Based on the results of the research, some suggestions for practitioners are following:

(i). E-assessment environments designed with PF can also be considered as a personal learning material.

(ii). In the e-assessment environment, personalization can be done by letting some of the processes to the learner control, such as choosing the topics to study, receiving feedback, choosing the content or source of the feedback message.

(iii). Collective research results explaining the relationship between personal characteristics and feedback in online environments should be used. Feedbacks in certain types or contents can be conveyed to individuals who are grouped according to one or more personal characteristics of these results.

(iv). PF environments can be developed not only according to the personal characteristics of the learner, but also according to their interests, desires and needs.

In order to develop a PF strategy about the feedback sources, further studies on teacher and peer feedback are needed. The strengths of peer review should be examined in detail with different research designs. Learners' trust to their peers can be achieved by increasing the quality of peer reviews and feedback. In this sense, the effect of peer assessment can be examined by giving professional training to learners on the issues such as peer feedback and rubric usage in e-assessment. Another method to improve the quality of peer reviews and to overcome peer trust problems may be that peer feedback can be provided by those who have high prior knowledge. For example, learners who have already taken the course can provide feedback to new learners.

Studies involving big data analysis that collect learners' feedback preferences from e-assessment environments along with some personal characteristics and that can predict their future choices will improve PF environments. In this way, systems that automatically send the most appropriate feedback to learners with similar characteristics or that can predict learning performance according to the feedback type they prefer can be developed such that they can be included in the same system in a few years.

Declaration of Conflicting Interests

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with the equal collaboration of the researchers.

Ethics Committee Approval Information

"Ethics Committee Approval Document" for the study was approved by the Committee for Humanities Researches in Eskisehir Osmangazi University Education Science Institute on 13.02.2017 (Meeting No: 2017-1).

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