THE IMPACT OF COGNITIVE AND NON-COGNITIVE FEEDBACK ON STUDENTS' ACHIEVEMENT IN A DISTANCE LEARNING ENVIRONMENT

By

ORIT ZEICHNER

Lecturer and Researcher, Kibbutzim College of Education Technology and Arts, Israel.

ABSTRACT

This paper deals with the field of "feedback intervention" in a distance learning environment. The study examines the influences of two types of feedback: cognitive content-oriented feedback designed to meet the student's cognitive needs relating to the curriculum, and non-cognitive feedback that refers to motivational–affective aspects of the learning process, in the form of axioms relating to the student's ability, on one hand, and the effort that the student puts into the learning process, on the other. The purpose of this study was to examine the differential effect of different types of feedback on the student's coping variables (cognitive assessment), i.e. the sense of threat and challenge, self-efficacy, and achievement. The rationale for choosing feedback axioms for motivation is based on recent theoretical models which focus on students' perceptions and beliefs as elements that affect their learning motivation. The study was conducted on 171 subjects divided into three study groups. Each group received a different type of feedback: content feedback, effort feedback, or ability feedback. The findings indicate that groups which received feedback relating to more than content show improved motivation, an increased sense of challenge and improved achievement in comparison to the group which received content feedback only. Small differences were found between the ability feedback and effort feedback groups.

Keywords: Ability Feedback, Effort Feedback, Motivation, Self-Efficacy.

INTRODUCTION

The issue of essential parameters to ensure effective learning has been a concern of theoretical and implicational research in the field of education for many years. Nonetheless, the question continues to be debated to this day – perhaps even more frequently – in the face of an ever-changing reality of advanced technology and abundant knowledge. The introduction of new technologies to the educational system is evident in, among other things, the development of new teaching strategies and new learning environments, including the "distance learning environment", with characteristics that are different from the regular classroom environment. The differences between these types of learning environments, in the mechanism of transfer of knowledge and the nature of the student-teacher dialogue, require new insights into the factors that shape the learning process and might influence its outcome. This is the environment in which this proposed study was held, relating to synchronous distance learning delivered by university teachers to high school students residing in peripheral areas.

Distance learning via computer allows us to expose a wide population of students, particularly in peripheral areas, to a high standard of teaching, especially in cases when available teaching assets do not provide a fitting answer to the needs of able students. Other advantages of distance learning include access to the curriculum at any given time and place, the option to demonstrate and visualize the curriculum through multimedia, using online

databases, updating and retrieving knowledge, and creating communication in a communal learning network (Schrum, 2015). These advantages, which represent predominant aspects of distance learning, entail another substantial aspect, namely the physical separation between students and teacher. This aspect includes the problematic issues that the current study highlights.

The teaching-learning process in a regular classroom is an interpersonal interaction, which allows a direct link and an immediate interaction between the teacher and students. In this concrete social environment, the interaction is based not only on verbal communication, but also on social features, such as facial expressions and gestures. These, for the skilled teacher, are vital signals for assessing the level of engagement of students in their class, and for identifying situations that require individual feedback to a student – as a direct answer to "signals" of embarrassment and difficulty relating to the curriculum or other causes (Moore and Kearsley, 2012). Identifying these situations in a distance learning environment is impossible. Moreover, the physical separation between the teacher and student might cause "transactional distance". This concept, coined by Moore (2013) indicates a psychological–communicational void which occurs during the lesson between the teacher and the students, and can result in gaps in understanding or misinterpretation of the students toward themselves and the learning process. These phenomena also take place in a regular classroom, but the direct relationship with the students can allow an alert teacher to identify and rectify them in real time (Dweck, 2012). However, in a distance learning environment, the psychological-communicational void might expand and lead to a cataclysm of failures.

Indeed, studies indicate several problems which can be traced back to the detachment between the teacher and the students, such as a lack of personal attention, not addressing personal needs, and difficulty in identifying students for whom the distance learning system is not beneficial (Muilenburg and Berge, 2015, 2016; Gunawardena, 2013, 2015; Hilton, et al., 2013; Richardson et al., 2016; Bernath et al., 2013). Other

studies found that the lack of face-to-face personal interaction resulted in a significant decline in the frequency of teacher-student interactions (Dinning et al., 2016; Offir et al., 2004; Oliver and McLoughlin, 2000; Twigg, 2015). Some claim that this might explain (at least partially) the high rate of dropouts (30%-50%) in a distance learning environment (Croxton, 2014; Ozaki, 2016; Sadykova, 2014). This assumption is supported by the work of Zirkin and Sumler (2008), and also in the critical analysis by Barberà et al. (2014). The findings in these studies clearly indicate that student-teacher interaction should increase in frequency, in order to both change negative perceptions of students regarding the learning process in that environment and to strengthen students' motivation and involvement.

It appears, that despite the advantages of distance learning strategies, this environment also introduces difficulty and challenge, principally – identifying the different needs of different students, and maintaining interaction to provide a suitable answer to their needs and allow effective learning. In other words, in conditions of lack of direct contact with the student, in a virtual environment the teacher has to know how to identify difficulty and non-adaptive perceptions of each of the students, and how to employ the computerized learning environment technology in order to assign each student feedback relating to them and their specific needs. Those questions represent the problematic issues that this study attempted to answer.

As a starting point, this study is based on the model proposed by Bransford et al. (2000) to design learning environments. Accordingly, an effective learning process is an intersection of three worlds: of knowledge, of the student, and of an assessment-centered world. From this divide into three worlds, which correlate and support each other, derive different types of evaluation, i.e. knowledge-centered evaluation which focuses on the curriculum, and alternatively, student-centered evaluation which focuses on their needs.

In addition, the study distinguishes between two main types of feedback: content-related feedback – aimed at the cognitive needs of the student in relation to the

curriculum of the course, and non-content-related feedback – directed at answering needs, which do not directly relate to the curriculum, but to the student in the learning situation; in other words, to student motivation, the effort they are willing to invest in order to succeed, and their perceptions of themselves and the learning process. The assumption is that an informed utilization of different types of feedback – directed at answering both cognitive needs and emotional and motivational needs – might lead to improvement of the student's self-capability perceptions, to an increase in the sense of challenge and as a result, improved achievement of students in a distance learning environment.

This assumption is included in the model examined in this study, in which - along with feedback variables – students' coping variables are also included. Inclusion of these variables is based mostly on an integrated approach, such as that of Park (1996), who recommended examining the interaction between motivational factors and teaching strategies in order to build a comprehensive understanding of the impact of feedback on the learning process.

This study's hypotheses were that we would identify differences between the three groups (content-related cognitive feedback, cognitive feedback and ability axiom, cognitive feedback and effort axiom) regarding self-efficacy and situational perception. Self-efficacy of subjects receiving effort feedback would be higher than self-efficacy of subjects receiving ability feedback, and they would perceive the situation as more threatening. The author has hypothesized similarly for differences between the three groups regarding achievement. Also she speculated that the level of achievement for subjects receiving content feedback would be higher than for subjects receiving ability feedback.

1. Literature Review

1.1 Feedback: Purposes and Influences

According to Kluger and DeNisi (1996) and DeNisi (2015), feedback is "information provided to an individual performing a task by an external element, regarding aspects of the task performance". According to another definition, feedback provides the student with information through which he/she can validate, correct, or read just his/her process, restructure interdisciplinary or meta-cognitive knowledge, and change perceptions regarding him/herself and tasks, tactics or cognitive strategies (Conrad, 2013; King, 2016). Feedback, as a result, might fulfill several functions: (a) validate a correct course of action for the student, and thereby, strengthen his/her perceptions as being suitable for the learning task objectives, (b) add information, and so enable the student to develop prior knowledge and enhance his/her understanding, (c) provide corrective information, which substitutes false elements in the prior knowledge, or prior perceptions which are no longer suitable (Butler and Winne, 1995; Ching and Hsu, 2016; Kramarski and Zeichner, 2001). Those different functions are included in what the professional literature defines as "informative feedback", feedback which provides information to the student about his/her response to the task presented to him/her. The differences between one informative feedback and another depend upon how information is delivered to the student (Kluger and DeNisi, 1996). The simplest feedback refers to the student's response in terms of right/wrong (KRO - Knowledge of Result Only); the most complex feedback is in the form of corrective information (KCR - Knowledge of Correct Response) which can elaborate on the context; whereas the third kind of feedback contains new material (KRE - Knowledge of Result Elaborated).

The feedback most commonly used in schools is of the first kind. Generally, feedback is given in the form of a score which allows the student to measure him/herself in relation to the rest of his/her classmates, and roughly speculate how close he/she is to achieving the target. In other words, this sort of feedback does not constitute qualitative criteria with which to compare the student's ability in comparison to him/herself. Furthermore, it lacks significant components of feedback as per its definition, namely a correction process which directs students to enhance their learning process and improve performance (Kluger and DeNisi, 1996). However, studies show that even the other two more complex informative feedbacks

do not necessarily produce favorable results. According to these studies, the informative feedback, with all its variations, can result in the opposite reactions. On the one hand – perseverance to finish the assignment, while on the other hand – withdrawal from learning (Brown et al., 2016; Butler and Winne, 1995; Dempsey et al., 1993; Duchaine et al., 2011; Llorens et al., 2016; Poulos and Mahony, 2008; White et al., 1993; Huges et al., 2014).

DeNisi (2015) also raised doubts about the value of informative feedback and claimed that it could even "act as a double-edged sword". This conclusion is based on a meta-analysis performed with the purpose of exploring the impact of different types of informative feedback on student performance. According to the analysis, which included 131 studies, in over a third of the studies (38%), feedback reduced performance. They further found that together with error correction of the learned subject, the correction feedback could cause the student an inadaptive perception – both with regard to the amount of effort that is worthwhile investing, and in the ability to succeed in the task. As types of feedback, such as grading performance, are problematic, in this study, we will not incorporate grading in order to avoid students' decline in motivation and to avoid comparison with other group members. Instead, alternative methods of providing feedback are explored, and use feedback styles aimed at the student's motivational aspects. In this study, an attempt was made to use feedback messages aimed at the students' abilities on one hand, and their efforts to invest on the other. These types should curb the motivation decline. The cognitive feedback in this paper does not include grading, but rather specifically amends mistaken concepts in the study material only.

Parallel to these studies, which were conducted in normal learning environments, in recent years, several studies have been conducted focusing on the feedback process in a distance learning environment. In this context, Twigg's (2015) comprehensive review includes study findings from universties and colleges, which examined the subject as part of the PEW Grant Program. It may be seen that feedback has great importance in the learning process. However, these studies do not provide specifics about the feedback process which is required in various situations, and lack empirical data regarding the effectiveness of the different types of feedback in this learning environment.

Thus, despite agreement on the purpose and necessity of feedback, there are still substantial questions regarding its practical contribution. Nevertheless, most research studies focused on informative feedback, primarily with the curriculum and cognitive aspects of learning, and is therefore ill-equipped to answer other needs of the student. Furthermore, in most studies which inspect the influence of feedback on learning outcomes, variation between students is not addressed (Maier et al., 2016; Muis et al., 2015). It is arguable that most of the attention is directed towards describing the methods and clarifying the influence of knowledge-oriented feedback (Bransford et al., 2000). However, the student's entity, tendencies, and unique needs are marginalized. This study attempts to complete the missing pieces, through examination of the influence of feedbacks directed at the student's motivational and emotional elements.

1.2 Self-Efficacy

In 1997, the American Psychological Association (APA) released a document detailing the principles of effective learning, which emphasized that one of the main tasks of the teacher is to influence the student's motivation utilizing supportive feedback during the learning process. Indeed, the importance of motivation is mentioned in the literature not only as a contributory element toward achievement, but is itself a vital product; i.e. learning achievement are not the only parameter sought after by the education system. Evaluation of learning as a concept, development of a long-term commitment to the concept of learning, and commitment to the effort needed to develop and utilize the skills and knowledge acquired by them, are of great importance (Ames and Fiske, 2015). Based on that it is not surprising that many studies attempt to answer the question – which strategies increase motivation amongst students?

Schunk et al., (2012) model represents three elements which should be taken into consideration when planning

strategies to strengthen the motivation of the student: expectations, values, and test anxiety. In the motivational context, expectation-oriented feedback is of high importance, shaping the students' belief in their ability to achieve their target, and strengthening their self-perception as someone capable of investing the required effort to obtain high achievement. The concepts 'ability' and 'effort' also appear in Keller and Kopp's model (1987), while additionally emphasizing the element of confidence. Therefore, the strategy for increasing motivation is by strengthening the students' confidence in their abilities and the feasibility of the effort and investment required of them (Chaiprasurt and Esichaikul, 2013).

A similar approach is presented by Ames and Fiske (2015), who focused on aspects related to student's thinking patterns and the learning process, including their perceptions and the reasons for their success or failure. From this starting point, they emphasize the need to devote attention to the type of feedback given by the teachers, which affect the student's motivational patterns. They claim that teachers must adopt strategies that increase positive motivation, and, at the same time, avoid creating negative motivation. This pattern of engagement is demonstrated in negative thoughts and perceptions, which discourage the students, instilling in them a sense of helplessness, resulting in a lack of perseverance and hence lower achievement. The causes for negative motivation might be related to personality variables or situational variables. Either way, in order to reduce the effect of negative motivation and to strengthen students' positive engagement, the teacher must adopt one of two feedback types: a) Focusing on the effort made by the student, while emphasizing the perception that mistakes and errors are an essential part of learning; b) Applying feedback that promotes the students' self-evaluation in their belief in their ability to put in the effort required to achieve their goal (Ames, 1992).

The models introduced above present different emphases, but point to the same conclusion; namely, in order to increase motivation, the teacher must identify the positions and needs of the individual student, and

adapt different types of feedback, relating not only to cognitive processes, but also to affective processes (Mory, 1996, 2004). In other words, in order to have a positive effect on the perceptions and attitudes of the students regarding themselves and the learning process, we should provide them with feedback reflecting improvements and achievement, not only in terms of knowledge, but also in terms of effort and ability (Butler, 2000).

Among the approaches relating to the motivational process, two theories, designed by Bandura, clarify the motivation of a person to persevere with an assignment: Control Theory (Bandura, 1993) focuses on the expectation of the individual regarding their prospects for success. Therefore, regarding coping with a learning assignment, the higher the student's expectation of success, the higher their perseverance in the assignment will be. On the other hand, according to the Cognitive Social Theory (Bandura, 1986) the measure of a student's perseverance reflects self-efficacy, that is, the students' perception of themselves as being capable of achieving their goal. This concept does not represent the self-perception of ability generally. In other words, self-efficacy is a goal-oriented or situation-oriented perception, and constitutes one of the foundations of the "self" which directs and guides behavior. This self-concept has significant ramifications to students' achievement and behavior. Mature children develop a differential view of effort and ability. While effort might increase the chances of success, ability sets the parameters for the achievement of efforts. Self-efficacy enters this "equation" as a cognitive moderator. That is, the students' perception of themselves as capable of coping with the assignment and their belief in the effectiveness of their coping process drive them to continue investing the effort and to persevere with the process – even though they are insecure regarding their level of knowledge.

This description not only strengthens the need for different types of feedback, but also hones the question of impact, namely, how is the student's self-efficacy perception influenced by content-related feedback as opposed to effort- and ability-focused feedback, and to what extent

does the self-efficacy perception influence the students' achievement, satisfaction and perseverance with the learning process?

1.3 Situational Perception - Sense of Threat and Challenge

The second coping variable examined in the study as a mediating factor is "sense of threat and challenge", which might inform us about the students' evaluation of the learning process, the distance learning environment, and the feedback provided in the course of their learning. This variable is based on Lazarus (2000) who emphasizes the importance of the cognitive assessing factor in reaction to and coping with stress. Accordingly, in an interaction situation or a series of interactions between an individual and his/her surroundings, perceiving the situation as positive or stressful is determined by a cognitive process of evaluation, which is influenced by three groups of factors: a) Situational features – level of familiarity, reasonable, clear, or distorted; b) Factors relating to social norms: role requirements, values, and customs; c) Elements relating to an individual's personality: motivation, self-perception, intelligence, and coping tendencies.

A situation which is evaluated as positive by an individual stimulates activity, while a situation evaluated as stressful triggers an emotional response of threat or challenge. Assessing a situation as a threat indicates the fear of potential trauma to the "self", and creates a sense of uncertainty and self-inefficacy. The more the potential trauma is perceived as more tangible and significant, so the threat increases. However, threat evaluation also depends on basic perceptions of one's surroundings and the level of confidence in one's ability to control the "danger". On the other hand, evaluating the situation as a challenge shows an expectation of control and/or potential gain. This evaluation is based on the perception that a new situation, change or other experiences constitute stimulation and a challenge for personal growth and development, not a threat to personal security (Lazarus, 2000).

2. Research Method

The study was conducted over one academic year, and 171 male and female high-school students aged 14-15 participated in the sample. The study was essentially a mixed methods approach. An "Introduction to Computer Science" course was taught in ten high schools as part of a distance learning program of the Education Department of X University. Successful completion of the course granted the participants academic points towards a university degree. During the course, the students were given assignments, and comprehension and progress tests were conducted. The responses to the examinees were divided randomly into three feedback groups. In one group (54), the students were given cognitive feedback only, i.e. content-related, while two other groups were provided with one of two kinds of non-cognitive feedback, i.e. axiom-related feedback directed at ability (50) and axiom-related feedback directed at effort (67). Axiom-related feedback directed at ability is designed to strengthen the students' confidence in their ability to succeed in the assignment, for example: "New beginnings are not always easy, even for high achievers". Axiom-related feedback, directed at effort is designed to strengthen the students' confidence that their efforts will lead to successful completion of the assignment, for example: "It is apparent from your test that you have put in considerable effort. Continue this way in order to increase your chances of success in the future". The learning process was conducted via an Internet site. Every student was assigned a personal folder. This enabled personal and constant contact with the student. The feedback on the tests was sent to the student's personal folder. The student confirmed that he/she had received the feedback. The feedback was saved in the personal folder throughout the course so that the student had a clear picture of the various phases of the course. During the course, the students were carefully monitored, with instant communication through e-mails.

2.1 Tools

The study included four questionnaires. The self-efficacy and situational perception questionnaires were handed out before and after the intervention. Personal data questionnaire – name, class, school, e-mail address, gender, age, and date of birth. Self-efficacy

questionnaire – the questionnaire was taken from Motivation Strategies for Learning Questionnaire – MSLQ by Pintrich et al. (1991), and examines the motivational orientation and the use of different learning strategies among high school students. MSLQ is composed of six sub-scales on motivation and nine sub-scales on learning strategies. The learning strategies are composed of 44 items on a Likert scale of 1 – "completely incorrect" to 7 – "definitely correct". Of the original questionnaire, this study utilized 16 items which examined self-efficacy (the students' perception of their ability to learn the curriculum and cope with assignments), i.e. "I'm certain that I'm capable of understanding even the hardest section of the reading material for this course". Analyses results of internal consistency of this variable were $\alpha = 0.96$.

2.1.1 Situational Perception Questionnaire – Sense of Threat and Challenge

This questionnaire is based on Lazarus and Folkman (1984) which includes 92 axioms and relates to two sub-topics. In this study, the author utilized 13 axioms relating to only one sub-topic: evaluating stressful situations as threat or challenge. The answers to the axioms are on a six-leveled scale from 1- "no threat at all" to 6 – "very much a threat". In the study, two versions of questionnaires were utilized: a) threat/challenge about university studies of computer science; b) threat/challenge about distance learning. The result of the analysis of the internal consistency of the sense of threat scale was $\alpha = 84$ and of the sense of challenge scale $\alpha = 76$. The grades were calculated using the average values for each of the scales, so a higher scale indicated more challenge and/or more threat.

2.1.2 Achievement Test

The test, which was compiled by the lecturer and the course staff, was given to the students at the end of the course. The achievement test was used to evaluate the students' abilities after finishing the course. It was designed to include all the topics studied in the course. Questions that evaluated the student's understanding of the subject were designed for every topic in the course. The test was given to four evaluators. Questions that were approved by 90% of the evaluators were included in the test. Most of the questions were multiple-choice questions, apart from the last section, in which the students were asked to provide a written answer and to write a working program. The questionnaire contained five sections: Computer Configuration and Operating Systems, Word, PowerPoint, Excel, and Visual Basic. Each section was graded separately. All of the sections, together, added up to 100 points. The sections "Computer Configuration" and "Word" each contributed 20% of the score, "Visual Basic" and "Excel" had a higher value, and "PowerPoint" was valued less. The score was calculated in percentages according to the number of correct answers/the sum of answers. The scores, therefore, ranged from 0 to 100 and the higher the score, the greater the student's achievement. The results were passed on to the researcher, and the scores were used to examine the different effects of the different types of feedback on the students' achievement.

3. Findings

The initial study hypothesis focused on the differences between the three study groups and the changes that took place between the measurements before and after concerning self-efficacy and sense of threat/challenge. The second study hypothesis dealt with the differences between the three study-groups concerning achievement measured during the second measurement.

Differences between the three groups in the measurements taken prior to the beginning of the intervention plan were measured using one-directional prediction analysis; no differences were found ($F_{(6, 208)} = .39$, $p > .05$).

The questionnaires were handed out after the intervention plan in order to examine whether differences between the groups occurred between the first and the second measurements. The author utilized a prediction analysis 3 x 2 (groups X time) with revised measurements in relation to time differential. A distinct difference was found between the before and after measurements ($F_{(3, 104)} = 9.14$, $p > .01$, Eta $= .21$) and a distinct interaction of groups x time was found ($F_{(6, 208)} = 29.95$, $p < .001$, eta

=.46). Table 1 represents the comparison between the groups for each of the parameters separately (Univariant ANOVA).

As is apparent in the Table 1, the author identified large differences between the first and second measurements relating only to challenge and self-efficacy, while a distinct interaction relating to all the parameters was found. Figures 1-3 represent the changes that occurred in the different groups for the three parameters.

Figure 1 displays the changes that occurred in the different groups regarding sense of threat. While subjects who received content feedback showed an increase in sense of threat, the other two groups showed a smaller change and the general direction was a reduced sense of threat. In a simple effect analysis, relating to each group separately, a distinct difference regarding sense of threat was found: No distinct differences were found among the subjects of the ability group, $F(1,106) = 2.77$, $P>.05$ $P=.099$, however, distinct differences among subjects receiving effort feedback were found, $F(1,106) = 6.43$, $P<.05$ eta=.06, $P=.013$ and among subjects receiving content feedback, $F(1,106) = 14.78$, $P<.001$ eta=.06, $P=.12$.

Nonetheless, it appears that most of the differences are a result of an increase in the sense of threat among the content feedback group as opposed to the decline in the other two groups.

Figure 2 represents the changes in sense of challenge, and shows a steep decline in the sense of challenge in subjects receiving content feedback and a relatively small change in the groups receiving threat and ability
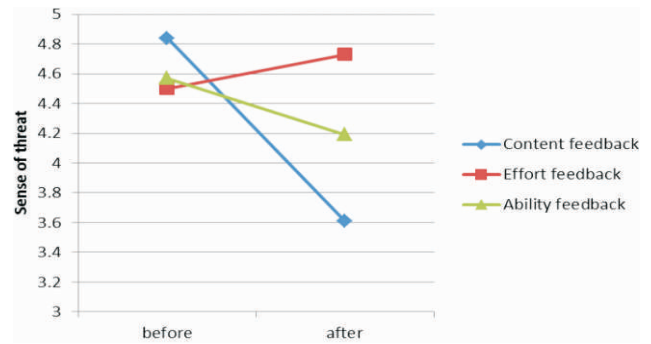

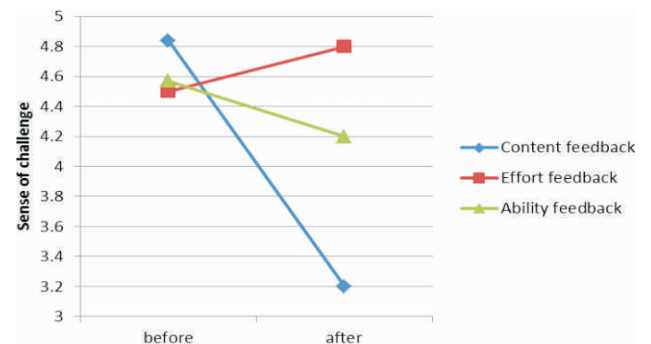Figure 1. Averages of "Sense of Threat" in Distance Learning Measurements, Before and After

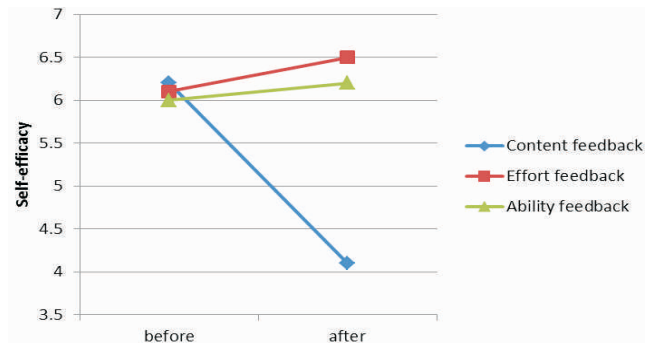Figure 2. Averages of "Sense of Challenge" in Distance Learning Measurements, Before and After

Figure 3. Averages of "Self-Efficacy" in Distance Learning Measurements, Before and After in

Variables		Study Groups						Time		Groups *time
		Ability Feedback (N=50)		Effort Feedback (N=42)		Content Feedback (N=26)		F(1, 106)	Eta	
		Before	After	Before	After	Before	After			F(2,103)
Challenge	M	4.57	4.19	4.5	4.73	4.84	3.61	22.27***	17.68***	17.68***
	SD	1.10	1.13	1.10	.83	.77	1.05			
Threat	M	1.86	1.68	1.78	1.51	1.73	2.25	.12	.001	11.73***
	SD	.79	.49	.73	.60	.57	.82			
Self-efficacy	M	5.81	6.34	5.82	6.54	5.99	3.87	13.10***	.11	114.54***
	SD	1.08	.64	1.04	.62	.68	.90			

Table 1. Comparison between Groups

feedbacks. Using effect analysis, the author found a distinct difference among subjects receiving ability feedback, $F(1,106) = 6.16$, $P<.05$ eta$=.06$. An even bigger difference was detected in the content feedback group, $F(1,106) = 40.10$, $P<.001$ eta$=.27$, while the effort feedback group showed little indication of change in the before and after measurements, $F(1,106) = 2.42$, $P>.05$. As stated previously, we found a clear interaction regarding self-efficacy.

Figure 3 shows a relatively similar picture to the sense of challenge diagram, that is, a reduction in self-efficacy among the content group and a relatively smaller change in the subjects of the ability feedback group $F(1,106) = 17.91$, $P<.001$ eta$=.14$, the effort feedback group $F(1,106) = 35.52$, $P<.001$ eta$=.25$, and the content feedback group $F(1,106) = 179.03$, $P<.001$ eta$=.63$.

In conclusion, the figures indicate an improvement in the ability feedback and the effort feedback groups, while the content feedback group shows a decline in values.

Upon completion of the course and the end of the intervention plan, the author examined students' achievement. To detect differences between the groups regarding achievements, a one-directional difference analysis (ANOVA) was conducted. A clear difference between the three study groups were found; $F (2, 110) = 115.20$, $P<.001$, Eta$^2=.68$. In a Scheffe pair-comparison analysis, distinct differences between all three groups were found, while the highest achievement were found in the effort feedback group, M$= 77.48$, SD$= 9.83$; lower achievement were found in the ability feedback group, M$= 62.88$, SD-1.81; and the lowest achievement were found in the content feedback group M$=37.71$, SD$= 9.52$. To examine whether the differences between the groups regarding achievement were a direct result of the changes in the measurements of sense of threat of challenge and self-efficacy, an ANCOVA analysis was conducted, in which the different measurements of cognitive evaluation were introduced as covariates. This analysis also found distinct differences between the three groups: $F (2,104) = 45.34$, $P<.001$ Eta$^2=.47$.

In conclusion, the findings of the study indicate that groups that received feedback relating to more than just content showed improvement in threat, challenge, and self-efficacy measurements, in comparison to the groups that did not get effort or ability feedback. Smaller differences were detected between the effort group and the ability group.

4. Discussion

The purpose of the study was to investigate the influence of three types of feedback on self-efficacy, sense of threat, sense of challenge, and achievement in a distance learning environment.

The hypothesis of the study claimed that differences between the three groups (content feedback, content feedback + ability feedback, and content feedback + effort feedback) would be found regarding self-efficacy, situational perception and achievement. The findings confirmed this hypothesis.

These findings correspond with other studies dealing with self-efficacy and challenge enhancement models. The effort and the ability feedback were designed according to theoretical models (Ames, 1992; Keller and Kopp, 1987; Linnenbrink, 2006; Pintrich, 2000), which view students' beliefs and perceptions as factors that influence their motivation to learn. Thus, effort and ability feedback strengthened the students' self-belief and attempted to strengthen their belief that they were able to put in the effort required to succeed. Ability or effort feedback also included the element of self-confidence (Keller and Kopp, 1987). Ames (1992) emphasized the importance of feedback and its influence on student motivational patterns. The teacher must enhance the sense of self-efficacy and avoid creating a decrease in levels of motivation, which could discourage the student.

The cause of negative motivation varies according to personality variables, environmental conditions and other causes. In Ames' opinion (1992), in order to negate the effect of negative motivation and strengthen positive engagement of the student, the teacher needs to implement two means: a) focusing on the effort put in by the student, while emphasizing that mistakes and errors

are an inevitable part of the learning process, and b) supplying students with feedback designed to enhance their self-esteem and belief in their ability to put in the effort required to achieve the goal.

Butler (1995, 2000) revalidates these conclusions, claiming that in order to obtain a positive influence on the students' perceptions and beliefs regarding themselves and the learning process, we must provide students with feedback that reflects their progress and achievement, not only in concepts of knowledge, but also in concepts of effort and ability.

As confirmed by the findings, these researchers also assume that feedback relating to affective processes enhances the student's perceptions and beliefs that s/he is capable of coping with a specific task. Moreover, as explained in the theoretical background, content feedback alone might reduce motivation rather than increase it. Kluger and DeNisi (1996) stated that feedback could act as a "double-edged sword". Instead of supporting the learning process, it might raise students' doubts regarding their ability to succeed and the worthiness of their efforts. Therefore, this study examined alternative parameters for feedback designed at increasing students' motivation.

While all of the aforementioned is important in a regular learning environment, in a distance learning environment the need for encouragement is even stronger. In a regular classroom, the teaching process is a face-to-face relationship, using direct conversation and instant interaction between the teacher and students. In a distance learning environment, the physical separation between the teacher and students might lead to a "transactional distance". Gaps in understanding the curriculum or misconceptions by the students regarding themselves can occur in a regular classroom, but the direct interaction between the teacher and the students allows a proficient teacher to identify these misconceptions and confront them in real time (Yeager and Dweck, 2012). In a distance learning environment, however, the 'psychological communicational void' (Moore, 2013) might expand to produce a cataclysm of failures. The distance learning environment has two main constraints: fewer non-verbal cues (Clark and Mayer 2016), and reduction in the sense of teacher presence (Garrison, 2012).

It has been deduced from the interviews that feedback fulfils the needs caused by the constraints of a distance learning environment. Students in a distance learning environment state a growing need for personal interaction, precisely because of the fact that it is obviously difficult to obtain in this specific learning environment. For example, "In a normal class, I talk to the teacher and get an answer, but in a distance learning environment, I do that through the personal folder"; "The help and personal assistance, you have no idea how much they improved my feelings". It is apparent that in a virtual learning environment, personal references might prove to be a crucial component of the teaching process.

In other studies (Sorensen, 2015), students criticized the staff of the institution for lack of personal references. This criticism indicates that when sitting in front of a computer screen and not a human figure, the need for personal emotional guidance increases.

The role of feedback as defined in the research literature (Kramarski and Zeichner, 2001; Llorens et al., 2016) was confirmed by interviewees; for example, "The feedback provided me with information so I could continue learning".

It should be pointed out that this study also demonstrated how content-only feedback reduces achievement and satisfaction, and that this finding confirms Kluger and DeNisi's (1996) assessment which was presented in the theoretical background (King, 2016).

The two limitations of distance learning (as aforementioned) lead to a third: low concentration span, and since there is a direct relationship between concentration span and motivation, and "motivation equals more effort…" (Offir et al., 2003), there is a possible correlation between the two; the feedback might have increased motivation and hence, the element of concentration. In addition, it is possible that concentration was increased by the feedback which, in

turn, raised the levels of motivation.

Until now, only a handful of researchers have focused on the difficulties of distance learning (Hara and Kling, 2002; Schank, 2002), and those studies focused on documentation and not on attempts to determine the effect of the types of feedback. Szücs and colleagues (2013) stated that feedback in a distance learning environment might provide confidence and increase the tendency to perseverance, but did not specify what type of feedback is required for this effect. Yeager and Dweck (2012) distinguished between two schemes that describe how a student achieves self-efficacy. The 'entity theory' schema leads to learning goals, and increases confidence and expectation of improvement. Effort feedback is based on the 'growth' schema (Keller and Kopp, 1987).

Ames (1992) distinguished between ability motivation and effort motivation, but did not clarify the distinction between the two. Dweck (2006) did specify the differences between the two, and this study is based on that distinction. The findings indicated certain differences (although not substantial) between the two feedback groups in measurements of self-efficacy. The effort feedback mainly produced higher results. It is possible that there are a number of reasons for the differences between effort and ability feedback:

- Different students require different types of feedback to support their learning process. Since the study groups were divided on a random basis, it is possible that these differences were represented within the two groups (that is, the effort feedback group contained subjects more suitable for ability feedback, and vice versa).

- The effort group might tend to be frustrated – a student who puts in effort, but does not reach his/her expected achievement, might be frustrated by feedback which in essence is saying 'keep trying, you can't always obtain high achievements', and therefore, the contribution of effort feedback is not necessarily higher than the contribution of ability feedback.

This finding is consistent with Dweck's (2006) assumption that pre-evaluation of students' ability to achieve can also decrease their achievement. Therefore, the mediating teacher must emphasize the importance of the process, as opposed to its outcome. The goal orientation field on which Dweck (2006) focuses is mainly part of the educational psychology field, and indeed most studies in that field involve children. However, there appears to be an overt relationship between it and other types of feedback.

Conclusions

From a theoretical aspect, the contribution of the study is in detecting the influences of different types of feedback in a distance learning environment, using an integrative model which includes student-related variables. Defining the relationship between the study's variables might greatly contribute to identification of the parameters required to utilize the advantages of a virtual learning environment, while overcoming the difficulties which it presents – specifically in the field of student-teacher interaction.

In practice, the results of the study might contribute to the design of virtual learning environments and the design of an effective model of distance learning for different students, while employing an informed approach to the individual differences between students. The study may introduce new insights for understanding the experience of the students as individuals, and may also aid in developing a feedback mechanism which could improve their ability to self-criticize and independently evaluate their steps and progress in the learning process, in general, and in distance learning, in particular.

The findings of this study, along with findings from studies already carried out in this field and future studies, are of great importance to those interested in the online learning environment, including teachers, assistants, staff, management, researchers, support teams, members of the community, and software manufacturers. All interested parties must recognize that technology is but a teaching tool, and each of them has the power to adapt

or change as necessary.

References

[1]. American Psychological Association. (1997). *Learner-centered psychological principles*. Washington, DC: Author.

[2]. Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*, 84(3), 261-271.

[3]. Ames, D. L., & Fiske, S. T. (2015). Perceived intent motivates people to magnify observed harms. *Proceedings of the National Academy of Sciences*, 112(12), 3599-3605.

[4]. Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

[5]. Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28(2), 117-148.

[6]. Barberà, E., Layne, L., & Gunawardena, C. N. (2014). Designing online interaction to address disciplinary competencies: A cross-country comparison of faculty perspectives. *The International Review of Research in Open and Distributed Learning*, 15(2), 142-169.

[7]. Bernath, U., Szücs, A., Tait, A., & Vidal, M.,(Eds.). (2013). *Distance and E-learning in Transition: Learning Innovation, Technology and Social Challenges*. John Wiley & Sons.

[8]. Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How People Learn: Brain, Mind, Experience and Schools*. Washington, DC: National Academy Press.

[9]. Brown, M., Kulik, C. T., & Lim, V. (2016). Managerial tactics for communicating negative performance feedback. *Personnel Review*, 45(5), 969-987.

[10]. Butler, D. L., & Winne, P. H. (1995). Feedback and Self-regulation Learning: A Theortical Synthesis. *Review of Educational Research*, 65(3), 245-281.

[11]. Butler, R. (1995). Motivational and informational functions and consequences of children's attention to peers' work. *Journal of Educational Psychology*, 87(3), 347-360.

[12]. Butler, R. (2000). Making judgments about ability: The role of implicit theory of ability in moderating inferences from temporal and social comparison information. *Journal of Personality and Social Psychology*, 78(5), 965-978.

[13]. Chaiprasurt, C., & Esichaikul, V. (2013). Enhancing motivation in online courses with mobile communication tool support: A comparative study. *International Review of Research in Open and Distributed Learning*, 14(3), 377-401.

[14]. Ching, Y. H., & Hsu, Y. C. (2016). Learners' Interpersonal Beliefs and Generated Feedback in an Online Role-Playing Peer-Feedback Activity: An Exploratory Study. *International Review of Research in Open and Distributed Learning*, 17(2), 106-122.

[15]. Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. John Wiley & Sons.

[16]. Conrad, D. (2013). Pondering change and the relationship of prior learning assessment to MOOCs and Knowledge in Higher Education. *PLA Inside Out: An International Journal on Theory, Research and Practice in Prior Learning Assessment*, 2(1).

[17]. Croxton, R. A. (2014). The role of interactivity in student satisfaction and persistence in online learning. *Journal of Online Learning and Teaching*, 10(2), 314-325.

[18]. Dempsey, J. V., Driscoll, M. P., & Swinddell, L. K. (1993). Text-based feedback. In J. V. Dempsey & G. C. Sales (Eds.), *Interactive Instruction and Feedback* (pp. 21-54). Englewood Cliffs, NJ: Educational Technology.

[19]. DeNisi, A. S. (2015). Some further thoughts on the entrepreneurial personality. *Entrepreneurship Theory and Practice*, 39(5), 997-1003.

[20]. Dinning, T. M., Maghill, C. A., Money, J., Walsh, B., & Nixon, S. (2016). Can a blended learning approach enhance students transition into higher education? A study to explore perception, engagement and progression. *International Journal of Advancement in Education and Social Science*, 3(2), 1-7.

[21]. Duchaine, E. L., Jolivette, K., & Fredrick, L. D. (2011). The effect of teacher coaching with performance

feedback on behavior-specific praise in inclusion classrooms. *Education and Treatment of Children*, 34(2), 209-227.

[22]. Dweck, C. S. (2006). *Mindset*. New York: Random House

[23]. Dweck, C. S. (2012). Mindsets and human nature: Promoting change in the Middle East, the schoolyard, the racial divide, and willpower. *American Psychologist*, 67(8), 614-622.

[24]. Garrison, D. R. (2012). Article review - Social presence within the community of inquiry framework. *The International Review of Research in Open and Distributed Learning*, 13(1), 250-253.

[25]. Gunawardena, C. N. (2013). Culture and online distance learning. In M.G. Moore (Ed.), *Handbook of distance education,* 3rd edition (pp. 185-200). New York: Routledge

[26]. Gunawardena, C. N. (2015). Building Online Learning Communities: Design Principles and Strategies. International Conference on the Humanities 2015: New Dynamics, Directions and Divergences (ICH 2015). University of Kelaniya, Kelaniya, Sri Lanka.

[27]. Hara, N., & Kling, R. (2002). Students' distress with a web-based distance education course: An ethnographic study of participants' experiences. In W. H. Dutton & B. D. Loader (Eds.), *Digital Academe: The New Media and Institutions of Higher Education and Learning* (pp. 62-84). London: Routledge.

[28]. Hilton, J, L., Gaudet, D., Clark, P., Robinson, J., & Wiley, D. (2013). The adoption of open educational resources by one community college math department. *The International Review of Research in Open and Distance Learning*, 14(4), 37–50.

[29]. Huges, E. M., Witzel, B. S., Riccomini, P. J., Fries, K. M., & Kanyongo, G. Y. (2014). A Meta-Analysis of Algebra Interventions for Learners with Disabilities and Struggling Learners. *Journal of the International Association of Special Education*, 15(1), 36-47.

[30]. Keller, J. M., & Kopp, T. W. (1987). An application of the ARCS Model of Motivational Design. In C. M. Reigeluth (Ed.), *Instructional Theories in Action: Lessons Illustrating Selected Theories and Models* (pp. 289-320). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

[31]. King, P. E. (2016). When do students benefit from performance feedback? A test of feedback intervention theory in speaking improvement. *Communication Quarterly*, 64(1), 1-15.

[32]. Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: Historical review, a meta-analysis and a preliminary feedback intervention theory. *Psychological Bulletin*, 119(2), 254-284.

[33]. Kramarski, B., & Zeichner, O. (2001). Using technology to enhance mathematical reasoning: Effects of feedback and self-regulation learning. *Education Media International*, 38(2-3), 77-82.

[34]. Lazarus, R. S. (2000). Toward better research on coping. *American Psychologist*, 55(6), 665-673.

[35]. Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal and Coping*. New York: Springer.

[36]. Linnenbrink, E. A. (2006). Emotion research in education: Theoretical and methodological perspectives on the integration of affect, motivation, and cognition. *Educational Psychology Review*, 18(4), 307-314.

[37]. Llorens, A. C., Vidal-Abarca, E., & Cerdán, R. (2016). Formative feedback to transfer self-regulation of task-oriented reading strategies. *Journal of Computer Assisted Learning*, 32(4), 314-331.

[38]. Maier, U., Wolf, N., & Randler, C. (2016). Effects of a computer-assisted formative assessment intervention based on multiple-tier diagnostic items and different feedback types. *Computers & Education*, 95, 85-98.

[39]. Moore, M. G. (Ed.) (2013). *Handbook of Distance Education*. Routledge.

[40]. Moore, M. G., & Kearsley, G. (2012). Technology and media (chapter 5). In *Distance Education: A systems view of on-line learning*, 3rd edition (pp. 72-96). Wadsworth Cengage Learning.

[41]. Mory, E. H. (1996). Feedback research. In D. H.

Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology* (Chap. 32, pp. 919-955). New York: Simon & Schuster MacMillan.

[42]. Mory, E. H. (2004). Feedback Research Revisited. In D. H. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology* (pp. 745-783). Mahwah, NJ, US: Lawrence Erlbaum.

[43]. Muilenburg, L. Y., & Berge, Z. L. (2015). Revisiting teacher preparation: Responding to Technology Transience in the Educational Setting. *Quarterly Review of Distance Education*, 16(2), 93-105.

[44]. Muilenburg, L. Y., & Berge, Z. L.(2016). In the eye of the Beholder. *Digital Badges in Education: Trends, Issues, and Cases*, 102.

[45]. Muis, K. R., Ranellucci, J., Trevors, G., & Duffy, M. C. (2015). The effects of technology-mediated immediate feedback on kindergarten students' attitudes, emotions, engagement and learning outcomes during literacy skills development. *Learning and Instruction*, 38, 1-13.

[46]. Offir, B., Barth, I., Lev, Y., & Shteinbok, A. (2003). Teacher-student interactions and learning outcomes in distance learning. *Internet and Higher Education*, 6(1), 65-75.

[47]. Offir, B., Lev, Y., Lev, Y., Barth, I., & Shteinbok, A. (2004). An integrated analysis of verbal and nonverbal interaction in conventional and distance learning environments. *Journal of Educational Computing Research*, 31(2), 101-118.

[48]. Oliver, R., & McLoughlin, C. (2000). Using Networking Tools to Support Online Learning. In F. Lockwood, & A. Gooley (Eds.), *Innovation in Open and Distance Learning* (pp. 149-162). Kogan Page, London

[49]. Ozaki, C. C. (2016). College Impact Theories Past and Present. *New Directions for Community Colleges*, 2016(174), 23-33

[50]. Park, O. (1996). Adaptive instructional systems. In D. J. Jonassen (Ed.), *Handbook of Research for Educational Communications and Technology* (pp 634-664). New York: Macmillan Library Reference.

[51]. Pintrich, P. R. (2000). Multiple goals, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology*, 92(3), 544-555.

[52]. Pintrich, P. R., Smith, D. A. F., Duncan, T., & McKeachie, W. J. (1991). *A Manual for the use of the Motivated Strategies for Learning Questionnaire*. Technical Report 91-B-004, Regents of the University of Michigan.

[53]. Poulos, A. & Mahony, M. J. (2008). Effectiveness of feedback: The students' perspective. *Assessment & Evaluation in Higher Education*, 33(2), 143-154.

[54]. Richardson, J. C., Besser, E., Koehler, A., Lim, J., & Strait, M. (2016). Instructors' Perceptions of Instructor Presence in Online Learning Environments. *International Review of Research in Open and Distributed Learning*, 17(4), 83-104.

[55]. Sadykova, G. (2014). Mediating knowledge through peer-to-peer interaction in a multicultural online learning environment: A case of international students in the US. *International Review of Research in Open and Distributed Learning*, 15(3), 25-49.

[56]. Schank, R. C. (2002). *Designing world class e-learning: How IBM, GE, Harvard Business School, and Columbia University are succeeding at e-learning*. New York: McGraw-Hill.

[57]. Schrum, L. (2015). *Distance Learning: Where have we been & where are we going?* Nova Southeastern University.

[58]. Schunk, D. H., Pintrich, P. R., & Meece, J. R. (2012). *Motivation in Education: Theory, Research, and Applications*. Pearson Higher Education.

[59]. Sorensen, C. (2015). An Examination of the Relationship between Online Class Size and Instructor Performance. *Journal of Educators Online*, 12(1), 140-159.

[60]. Twigg, C. A. (2015). Improving Learning and Reducing Costs: Fifteen years of Course Description. Change: *The Magazine of Higher Learning*, 47(6), 6-13.

[61]. White, J. A., Troutman, A. P., & Stone, D. E. (1993). Effects of three levels of cognitive feedback and two

cognitive levels of tasks on performance in computer-directed mathematics instruction. *Journal of Computer-Based Instruction*, 18(4), 130-134.

[62]. Yeager, D. S., & Dweck, C. S. (2012). Mindsets that promote resilience: When students believe that personal

characteristics can be developed. *Educational Psychologist*, 47(4), 302-314.

[63]. Zirkin, B. G., & Sumler, D. E. (2008). Interactive or Non-interactive? That is the Question!!! *International Journal of E-Learning & Distance Education*, 10(1), 95-112.

ABOUT THE AUTHOR

Dr. Orit Zeichner is working as a Lecturer and Researcher in Kibbutzim College of Education Technology and Arts, Israel. She specializes in Educational Technology. Orit has worked for many years as a teacher educator teaching pre-service teachers in Kibbutzim College of Education and the Arts. She has also worked as a Researcher at the University's Distance Learning Laboratory, where she examined the role of feedback in distance learning. Her academic publications include the identification of evidence-based ways to help university faculty improve the quality of teaching online.