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Distance Learning by Exam as Support of Traditional Method of Education

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Abstract—Pedagogical experiment showed that the author's method of distance learning by exam, carried out using e-mail, allowing students to correct their exam works and, consequently to raise their grades, is effective in case of difficult transfer tasks, increases motivation of learners and fosters durable knowledge. The efficacy of the method depends on encouragements addressed to all students to take the attempts to raise their grades. It is advisable to conduct further research into ways and forms of their use. The study confirmed that e-mail can be an effective tool for communication between student and her/his teacher.

Keywords—E-mail, distance learning, motivation, transfer, encouragement.

I. INTRODUCTION

RICHARD E. Mayer indicates "learning-centered" approach as a condition for the effective use of technology in education. This strategy is considered by him in aspect of adaptation of digital tools to support the learning process [1].

In the process of teaching e-mail can be useful supporting tool [2], the use of which helps in keeping close relationships between student and teacher [3] and in increasing the sense of psychological comfort of the learner [4]. The exchange of information via e-mails also fosters her/his reflection over assigned task and promotes critical thinking, probably due to the time interval between receiving message and preparing and sending response, and thanks to the durability of written words [5, 6].

Role of the teacher is to mobilize students to become more involved in the process of acquiring knowledge and skills [7] by selecting appropriate learning strategies [8] and by using techniques of external reinforcements [9, 10]. Communicating with teacher by e-mail enhances self-confidence, self-esteem, and motivation of the learner [11], understood as "the reasons that underlie behaviour" [12], which in the case of students arise from subjective experiences shaping willingness to learn [13]. According to Czeslaw Kupisiewicz these experiences include, among others, "a sense of success (and) the awareness of effective liquidation of barrier encountered in work" [14]. E-mail is a tool allowing to provide students with didactic instructions that are compatible with their individual needs [15], what in the context of Tadeusz Lewowicki's definition of teaching individualization, may be pedagogical action beneficial to personality development [16]. "Control, really valuable for learning process of the student, is also individualized" [17].

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E-mail can also help students with the low levels of volition and self-regulation to develop the strategies for overcoming barriers appearing in the case of difficult learning material [5, 18, 19].

According to Robert DeBard and Stan Guidera, e-mail triggers interaction of the student and promotes his deeper involvement in the learning process, as well as greater activity [20], because "true learning cannot take place when students are passive observers of the teaching process" [21].

Transfer tasks required from students an active engagement. In the opinion of Beryl Hesketh transfer in education refers to transfer of the knowledge, skills and attitudes from the sphere of learning to work context, from task to task [22]. When the situation and context are similar to those that occurred at a stage of learning, the transfer is near, while they are different, then the transfer is far [23], and learners need to analyze the new situation more deeply to properly apply the acquired knowledge and skills. David N. Perkins and Gavriel Salomon recommend the use of two learning strategies to promote the transfer: 1) strategy of hugging, directly engaging the learner in the tasks similar to the target tasks, for example teacher gives a sample of exam test instead of talking about the technique of exam; 2) strategy of bridging, in which the teacher encourages students to develop their own strategies of exam passing based on the previously gained experience [24].

The aim of the study was to empirically determine the educational effectiveness of the method of distance learning by exam, designed to teach via e-mail how to transfer the knowledge and skills acquired during academic activities into the sphere of professional practice, assuming the use of hugging strategy. An additional purpose of the study was to determine the motivational value of encouraging students to take many attempts to increase the obtained grades.

Conducted investigations were focused on verification of three hypotheses: 1) The method of distance learning by exam motivates students to increase their exam projects' grades; 2) Students taught by method of distance learning by exam who attempt to raise their exam projects' grades, receive better ultimate grades of these works than students who don't enjoy such possibilities; 3) Students who learn by method of distance learning by exam, additionally encouraged to raise their exam papers' grades, show significantly greater motivation for activities in this field, than students who are not encouraged.

II. RESEARCH METHODS

A. Applied techniques and procedures

The empirical material was collected using techniques of pedagogical experiment and of documents analysis.

The experiment was conducted by Author in terms of real educational process in 2012/2013 academic year. Students

passed the lab of Information Technology course by the method of distance learning by exam. For this purpose each student develops at home the projects of: 1) Computer didactic presentation, 2) Set of computer skills tests regarding a program selected by her/him from Ms Office package. She/he sent ready projects to instructor via e-mail. The students received feedback containing proposal of grade and verbal & pictorial commentary indicating the strengths of the projects and their errors, as well as containing proposals for the amendments and examples of their visuals. In this way students could improve their projects many times, until a top rating or until the deadline for submitting the works. The exchange of comments and files between instructor and students was held by e-mail.

In exam process instructor encouraged some of students to undertake attempts to increase obtained assessment of the project by making amendments suggested by him.

Preparing the projects of the presentation and of the tests required the transfer of knowledge gained by student during lab. Strategy of hugging was applied in order to support the transfer.

It was based on providing learners the folder containing exemplary presentations and tests, as well as detailed description of the requirements which projects developed by students should meet.

For each project the student could get positive grade: 3,0; 3,5; 4,0; 4,5; or 5,0.

B. Surveyed groups

Among 69 freshmen from five groups of pedagogical studies conducted by the Academy of Special Education in Warsaw, passing lab of Information Technology through the project of didactic presentation, were selected N_P=56 participants of experiment (96.43%; n=54 women, and 3.57%; n=2 men), who submit their works within the deadline and who obtained positive grade.

Moreover, 56 students from four of the mentioned five groups were required to send additionally the projects of tests in order to complete the same lab, in this N_T=46 persons (95,65%; n=44 women and 4.35%, n=2 men) received the positive grade within the deadline.

The experiment was conducted on two groups of students: N_P=56 and N_T=46.

C. The tools used during experiment

E-mail; Computer stations; Microsoft Office computer software package; The folder containing the file with the description of requirements to be met by exam projects and the files with exemplary presentations and tests; Sets of commands for lab tasks; Questionnaires of projects assessment.

III. RESEARCH RESULTS AND THEIR ANALYSIS IN CONTEXT OF HYPOTHESES

A. Presentation

Among 56 students who were preparing project of presentations, more than half of them 57.14% (n=32) didn't attempt to increase the first positive grade (FPG), in this 8.93% (n=5) of persons didn't make it, because they obtained FPGs at a maximum level equal to 5.0, and 48.21% (n=27) of students with grade lower than 5.0 resigned from such chance (Fig. 1).
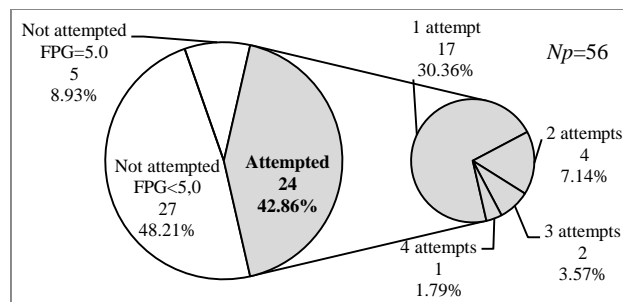

Fig 1. The percentage of students passing project of presentation, who attempted to raise their FPGs.

Less than half of the participants 42.86% (n=4) received FPGs of 4.5 or lower and made at least one attempt of grade raising, whereby one attempt was taken by 30.36% (n=17) of students, two attempts were taken by 7.14% (n=4) of persons, three attempts were taken by 3.57% (n=2) of people, and only one student made four attempts.
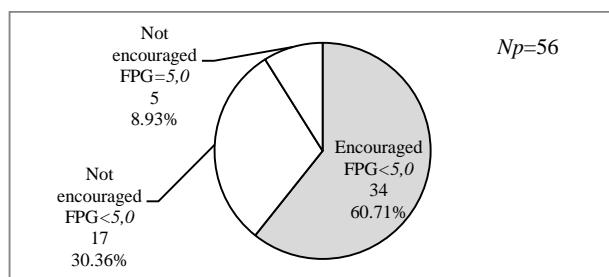

Fig 1. The percentage of students passing project of presentation, encouraged and not encouraged to attempting to rise their FPGs.

Sixty and 71/100% (n=34) of students were subjected to additional encouragements motivating for attempting to raise FPGs (Fig. 2). People who weren't encouraged constituted 30.36% (n=17) of all participants. The FPGs at a level equal to 5.0 were received by 8.93% (n=5) of students.

1. Results analysis in context of the hypothesis no. 1.

Statistical examined student having the opportunity to raise a grade, obtained a high ultimate positive grade (UPG) for project of her/his presentation (table I).

TABLE I
MEANS OF FPGs AND UPGs IN GROUPS OF STUDENTS PASSING PROJECTS OF PRESENTATION, WHO ATTEMPTED OR DIDN'T ATTEMPT TO RISE THEIR FPGs. ON THE BASIS OF PAIRED SAMPLES TEST.

Group/subgroup	M_{FPG}	M_{UFG}	$M_{UFG}-M_{FPG}$
Group P FPG≤4.5, attempted+not attempted, n=51	3.56 (SD=0.45)	4.04 (SD=0.73)	0.48* (SD=0.62)
Subgroup P1 FPG≤4.5, attempted, n=24	3.63 (SD=0.52)	4.65 (SD=0.52)	1.02** (SD=0.50)
Subgroup P2 FPG≤4.5, not attempted, n=27	3.50 (SD=0.39)	3.50 (SD=0.39)	0

* $t_P(50)$=5.568, p<0.001, ** $t(23)$=10.011, p<0.001

The group of n=51 participants who received FPGs at maximum level of 4.5 (group P), the mean of ultimate positive grade M_{UFG} was 4.04 (SD=0.73). In the subgroup P1 counting n=24 individuals characterized by FPG equal to or lower than 4.5, and undertaking attempts to raise their FPGs, this mean remainded at a higher level M_{UFG}=4.65 (SD=0.52). On the other hand, among people with FPG≤4.5 (n=27) who didn't attempt

to increase it (Subgroup P2), M_{UPG} was relatively low $M_{UPG}=M_{FPG}=3.5$ ($SD=0.39$).

Statistical student having the opportunity to improve her/his project of presentation, obtained UPG significantly higher than FPG. Participants of exam process of group P, increased FPGs on average of 0.48 ($SD=0.62$) (Table 1). All persons of the subgroup P1 received UPGs higher than FPGs, and the difference between M_{UPG} and M_{FPG} was 1.02 ($SD=0.50$). Strength of FPG raising effect was determined by d$Cohen$ factor. For group P it was found medium strength of connection between pairs of FPGs and UPGs (d$Cohen$ factor=0.77), whereas in the subgroup P1 this connection proved very strong (d$Cohen$ factor=2.04).

Students attempting to increase their grades for the projects of presentation usually aspired to obtain maximum rate of 5.0. Among participants of subgroup P1, 62.50% ($n=15$) of persons received UPGs on the level of 5.0, in this 50% of students were increasing FPGs equal to or lower than 4.0.

The above analysis of collected data confirmed the correctness of the hypothesis no. 1. The method of distance learning by exam motivated students to raise assessments of their presentations projects.

2. Results analysis in context of the hypothesis no. 2.

Students from the subgroup P1 obtained mean ultimate positive grade of their projects of presentation $M_{UPG}=4.65$ ($SD=0.52$) higher by 1.15 grade than students from subgroup P2 characterized by $M_{FPG}=3.50$ ($SD=0.39$) (table 1).

The gathered empirical data allowed to confirm the hypothesis no. 2. Students who learned by method of distance learning by exam and who attempted to raise their grades for projects of presentation, obtained higher rates of these works than students who didn't benefit from that option.

3. Results analysis in context of the hypothesis no. 3.

Among 34 persons encouraged to raise FPGs of their projects of presentation (group PE), 61.76% ($n= 21$) of students attempted for this purpose, while 38.24% of students ($n= 13$) resigned from this opportunity. In the group of 17 participants not encouraged (group PNE), only 17.65% (n=3) of them attempted to rise their grades, while the remaining 82.35% ($n=14$) of students didn't attempt to do it.

Students from the subgroup PE obtained a a moderately higher $M_{UPG}=4.21$ ($SD=0.78$) (Table 2) vs $M_{UPG}=3.71$ ($SD=0.78$) in the subgroup PNE.

TABLE II

MEANS OF FPGs AND UPGs IN SUBGROUPS OF STUDENTS PASSING PROJECTS OF PRESENTATION, ENCOURAGED OR NOT ENCOURAGED TO RISE THEIR FPGs. ON THE BASIS OF PAIRED SAMPLES TEST.

Subgroup	M_{FPG}	M_{UFG}	$M_{UFG}-M_{FPG}$
Subgroup PE FPG≤4.5, encouraged, $n=34$	3.79 ($SD=0.43$)	4.21 ($SD=0.78$)	0.41* ($SD=0.50$)
Subgroup PNE FPG≤4.5, not encouraged, $n=17$	3.56 ($SD=0.39$)	3.71 ($SD=0.51$)	0.15** ($SD=0.34$)

* $t_P(33)=3.372, p<0.01$, ** $t(16)=1.768, p<0.1$

Participants from subgroup PE achieved in the process of exam M_{UPG} significantly higher than M_{FPG} (Table II). They raised its value an average of 0.41 grade ($SD=0.71$). Participants from the group PNE obtained M_{UPG} higher than M_{FPG} of

nonsignificant value of 0.15 grade ($SD=0.34$). Strength of the raising effect of FPG for subgroup PE was medium (d$Cohen$ factor=0.58), whereas for subgroup PNE it was small (d$Cohen$ factor=0.44).

Forty-one and 18/100% of encouraged students from subgroup PE ($n=14$) increased their UPGs up to maximum grade 5.0, in this 8.82% ($n=3$) of persons are made it from a level of FPG=4,5. Among not encouraged participants (subgroup PNE) this percentage was 5.88% ($n=1$) only.

Presented analysis of the results confirmed partly the correctness of the hypothesis no. 3. Students who learned by the method of distance learning by exam, additionally encouraged to raise their grades of presentation, were characterized by greater (but not much more greater) motivation to attempt in this area, than students not encouraged. The increase of FPGs on average by 0.41 grade in the subgroup PE was a moderate and used encouragements have proven to be ineffective for up to 38.24% of students not attempting to rise the first positive grades for presentation.
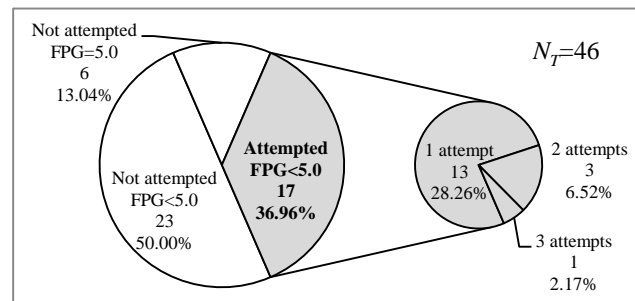

Fig. 3. The percentage of students passing project of tests, who attempted to raise their FPGs.

B. Tests

$N_T=46$ students submitted project of tests. In this 36,96% ($n=17$) of persons took the opportunity to rise their FPGs (Fig. 3). Sixty three and 04/100% ($n=29$) of participants didn't take attempts for this purpose, wherein 13,00% ($n=6$) of participants received the maximum FPGs of 5.0, and 50,00% ($n=23$) received FPGs equal to or lower than 4,5 but they resigned from chance of their increase. The most students 28,26% ($n=13$) who aspired to rise their FPGs took one attempt only, two attempts made 6,52% ($n=3$) of participants, and three attempts made one person.

Sixty and 87/100% ($n=28$) of persons passing project of tests, who received FPGs of 4.5 or lower, were subjects to additional encouragements (Fig. 4). Students not encouraged with such FPGs were 30.36% ($n=17$) of all participants, and 13.04%
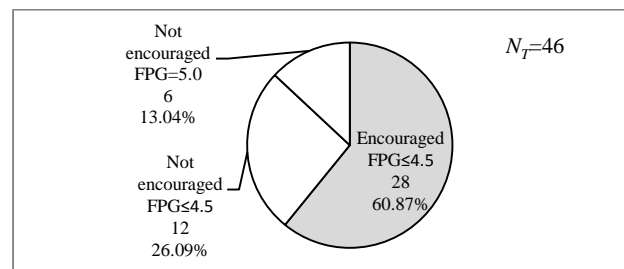

Fig 4. The percentage of students passing project of presentation, encouraged and not encouraged to attempting to rise their FPGs.

(*n*=6) of participants received first positive grades at maximum level of 5.0.

1. Results analysis in context of the hypothesis no. 1.

Students having the opportunity to raise first positive grades of their tests projects, obtained high UPGs (table 3). In group of 40 participants characterized of FPGs of at most 4.5 (group T), it noted M_{UPG} equal to 4.25 (*SD*=0.62), whereas in subgroup T1 gathering *n*=16 persons, who received such FPGs and who attempted to rise them, this mean was very high, M_{UPG}=4.74 (*SD*=0.36). Students with FPGs equal to or lower than 4.5, who didn't take the attempts to rise them (subgroup T2, n=23) achieved $M_{FPG}=M_{UPG}$=3.89 (*SD*=0.52).

TABLE III
MEANS OF FPGs AND UPGs IN GROUPS OF STUDENTS PASSING PROJECTS OF TESTS, WHO ATTEMPTED OR DIDN'T ATTEMPT TO RISE THEIR FPGs. ON THE BASIS OF PAIRED SAMPLES TEST.

Group/subgroup	M_{FPG}	M_{UFG}	$M_{UFG} - M_{FPG}$
Group T FPG≤4.5, attempted+not attempted, *n*=40	3.74 (*SD*=0.51)	4.25 (*SD*=0.62)	0.51* (*SD*=0.69)
Subgroup T1 FPG≤4.5, attempted, *n*=17	3,53 (*SD*=0.41)	4,74 (*SD*=0.36)	1,21** (*SD*=0.53)
Subgroup T2 FDG≤4.5, not attempted, *n*=23	3,89 (*SD*=0.52)	3,89 (*SD*=0.52)	0

* $t_P(39)$=4.675, p<0.001, ** t(16)=9.345, p<0.001

Persons having the opportunity to improve their projects of tests in order to rise the grades, achieved UPGs significantly higher than FPGs (table III). Participants of group T obtained M_{UPG} higher than M_{FPG} of 0.51(*SD*=0.69). In subgroup T1 only one student didn't rise her/his FPG, while other 16 participants obtained their UPGs higher than FPGs. Difference $M_{UPG}-M_{FPG}$ was 1.21 (*SD*=0.53) in this case. In group T it was found medium strength of connection between pairs of FPGs and UPGs (d*Cohen* factor=0.74), while in subgroup T1 this connection was very strong (d*Cohen* factor=2.28).

Most of students from subgroup T1 58.82% (*n*=10) ended process of increasing their FPGs on the level of UPG=5.0, in this 52.94% (*n*=9) of participants were beginning it from FPGs equal to or lower than 4.0.

Above described analysis confirmed the correctness of the hypothesis no. 1. The method of distance learning by exam motivated students to raise assessments of their projects of tests.

2. Results analysis in context of the hypothesis no. 2.

In the case of participants from the subgroup T1 M_{UPG} (4.74; *SD*=0.36) was of 0.85 grade higher than M_{UPG} characterized students from subgroup T2 (3.89; *SD*=0.52) (table III).

These figures indicate the correctness of the hypothesis no. 2. Students who learned by method of distance learning by exam, who attempted to raise their grades for projects of tests, obtained higher grades of these works than students who didn't want to use that option.

3. Results analysis in context of the hypothesis no. 3.

In the subgroup TE gathering 28 students subjected to encouragements to raising their grades of tests projects, slightly more than half of them 53.57% (*n*=15) made for this purpose at least one attempt, and nearly half of them 46.43% (*n*=13) didn't attempt to do it at all. Among 12 people who weren't subjected to encouragements (subgroup TNE), only two participants

16.67% attempted to raise their FPGs, and as many as 83.33% (*n*=10) of participants resigned from such possibility.

In comparison with M_{UPG}=3.88 (*SD*=0.57) noted for subgroup TNE, value of M_{UPG}=4.41 (*SD*=0.58) noted for subgroup TE was high (Table IV).

TABLE IV
MEANS OF FPGs AND UPGs IN SUBGROUPS OF STUDENTS PASSING PROJECTS OF TESTS, ENCOURAGED OR NOT ENCOURAGED TO RISE THEIR FPGs. ON THE BASIS OF PAIRED SAMPLES TEST.

Subgroup	M_{FPG}	M_{UFG}	$M_{UFG} - M_{FPG}$
Subgroup TE FPG≤4.5, encouraged, *n*=28	3.73 (*SD*=0.48)	4.41 (*SD*=0.58)	0.68* (*SD*=0.75)
Subgroup TNE FPG≤4.5, not encouraged, *n*=12	3.75 (*SD*=0.58)	3.88 (*SD*=0.57)	0.13** (*SD*=0.31)

* $t_T(27)$=4.800, p<0.001, ** $t_T(11)$=1.393, p>0,1

Persons of the subgroup TE obtained M_{UPG} significantly higher than $M_{FPG,}$ and the difference M_{UPG} - M_{FPG} was 0.68 (*SD*=0.75) (Table IV). For the subgroup TE it was noted very strong d*Cohen* effect equal to 0.91 concerning the FPGs increasing. In the subgroup TNE irrelevant average growth of FPGs at the level of M_{UPG}-M_{FPG}=0.13 (*SD*=0.31) was accompanied by a weak d*Cohen* effect of raising FPGs equal to 0.39.

Slightly more than 1/3 of the student from the subgroup TE 35.71% (*n*=10) attempted to increase their grades up to maximum note 5.0, wherein in the case of 32.14% (*n*=9) of persons their FPGs were equal to or lower than 4.5. In the subgroup NTE none of the students raised the note to 5.0.

Presented analysis did not fully confirm the correctness of the hypothesis no. 3. Students who learned by the method of distance learning by exam, subjected to additionally encouragements to raise their grades for tests projects showed greater (but not significantly greater) motivation to attempt in this field than students not subjected to encouragements. The average increase of FPGs in the subgroup of encouraged students was 0.68 grade, and encouragements were ineffective in the case of almost half of the participants 46.43%.

C. Summary

Analysis of empirical data collected during experiment confirmed the correctness of hypotheses no. 1. The method of distance learning by exam motivated students to raise their grades for educational presentations projects as well as for sets of skills tests projects. Hypothesis no. 2 was also confirmed. Students who learned by distance learning by exam who undertook attempts to rise their grades of both exam works, obtained higher ultimate positive grades than students who didn't take advantage of such opportunities.

The verification of the hypothesis no. 3 showed that students taught by distance learning by exam additionally, encouraged to increase both works grades, gained greater motivation for action in this area than students not encouraged. This motivation was however not much higher, as it was hypothetically founded.

IV. CONCLUSIONS

1. Method of distance learning by exam is didactically effective in the case of difficult transfer tasks. It raises the motivation of students to undertake the attempts to increase grades by

repeatedly entering amendments suggested by the instructor, what helps learners to acquire additional skills and knowledge, to fix them, to supplement deficiencies, as well as to seek to achieve expert-level qualifications in education. As a result, the persons undertaking attempts to increase their grades not only received significantly higher grades of exam works than students who didn't take such attempts, but also acquired more permanent knowledge.

2. Method of distance learning by exam is a tool for assessing of learning outcomes as well as is motivating, effective way of teaching.

3. Motivating encouragements, given by the instructor to persuade students to improve their exam papers and to obtain higher grades of them, can be a key factor of effectiveness of distance learning by exam method. The encouragements should be used to all students. However, one should consider what encouragements to apply and how to encourage individual students, to make motivating force greater (so that more people attempted to obtain the maximum grade).

4. Properly used e-mail can be effective tool of communication between student and instructor in the learning process. It allows to send the word & picture information regardless of time and stay place of educational process participants, ensures its permanent record that allows learners to multiple recall the content, and leaves the time for rethink, which in turn helps students in critical self-assessment of their skills, knowledge and competence.

E-mail is an environment which is little stressful for the student. No direct visual and voice contact with the instructor eliminate the negative feelings related to eg. the voice intonation and facial expressions of interlocutor, as well as gives a sense of anonymity. In case of contact via e-mail there is also not the fear factor before the public (in class) discussing about the failures of the student, which can lead to low self-esteem and her/his unwillingness to learn specific topics.

E-mail allows largely for the realization of individual course of education, and for the frequent, deeply thought-out feedback. It can also increase the motivation of student resulting from the sense that the instructor is interested in her/his success progress in a special way and cares for high assessment of her/his exam works.

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